CHEMICAL HERITAGE FOUNDATION

MADELINE M. HENDERSON

Transcript of an Interview
Conducted by

Robert V. Williams

at

Mechanicsville, Maryland

on

14 July 1997

(With Subsequent Corrections and Additions)

Madeline M. Henderson

CHEMICAL HERITAGE FOUNDATION
Oral History Program
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MADELINE M. HENDERSON

1922 Born in Merrimac, Massachusetts on 3 September

Education

1944 A.B., chemistry, Emmanuel College
1977 M.P.A., public administration, American University

Professional Experience

E.I. DuPont de Nemours & Co., Inc.
1944-1945 Analytical Chemist

C.S. Batchelder Co.
1945-1946 Organic Researcher

Massachusetts Institute of Technology
1946-1950 Research Associate, Chemical Engineering
1950-1952 Research Associate, Scientific and Technical Documentation

1953 Consultant, United States Government

Battelle Memorial Institute
1953-1956 Research Engineer, Information Systems

National Science Foundation
1956-1958 Research Analyst, Office of Science Information Service
1958-1962 Consultant

National Bureau of Standards
1964-1969 Data Processing Applications Analyst, Center for Computer Sciences and Technology
1969-1971 Consultant to Director, Center for Computer Sciences and Technology

United States Department of Commerce
1971-1972 Science and Technology Fellow

National Bureau of Standards
1972-1975 Staff Assistant for Computer Usage Information, Institute for Computer

	Sciences and Technology
1975-1978	Chief, Computer Information Section, Information Technology Division, Institute for Computer Sciences and Technology
1978-1979	Manager, ADP Information Analysis, Institute for Computer Sciences and Technology
1979-1991	Consultant

Honors

1977	Election to Pi Alpha Alpha
1989	Watson Davis Award, American Society for Information Science

ABSTRACT

Madeline Henderson begins this interview with a description of her family and early years in Quincy, Massachusetts. Henderson attended Emmanuel College, receiving an A.B. in chemistry in 1944. After college, she worked briefly with DuPont in explosives research and as a chemist for Harrington Labs. She accepted a position at the Massachusetts Institute of Technology's (MIT) High Pressure Research Lab as a research associate. In 1950, she switched gears at MIT and began working with James W. Perry in scientific information. One of her first tasks was to edit the first edition of his book, *Punched Cards: Their Application to Science and Industry*. Henderson worked with Perry and Allen Kent compiling and researching possibilities for a standard chemical notation system for IUPAC selection. Her search for terms for semantic factoring took her throughout the country, where she met many others involved with scientific information, including Eugene Garfield, Claire Schultz, and Saul Herner. Soon after, Henderson worked for the Batelle Memorial Institute at the Aberdeen Proving Ground helping them improve their information management. While there, she, Perry, and Kent initiated the use of telegraphic abstracts. After working with the National Science Foundation as a research analyst, Henderson joined the National Bureau of Standards (NBS) in 1972. There she served as a staff assistant in the Institute for Computer Sciences and Technology, and eventually became section chief of Computer Information. Later, she worked on the Federal Information Locator System (as a consultant for NBS). While with NBS, she joined the Federal Library Committee's Task Force on Automation, and attended American University, receiving an MPA in 1977. She received the Watson-Davis award in 1989 for her service to the American Society for Information Science. Henderson concludes the interview with reflections on her fellowship with the American Association for the Advancement of Science and thoughts on pioneers in the field of information science.

INTERVIEWER

Robert V. Williams is a professor of library and information science at the University of South Carolina. He holds a Ph.D. in library and information studies from the University of Wisconsin, Madison; an M.S. in library and information science from Florida State University; and an M.A. in history from New York University. Before joining the University of South Carolina in 1978, he was an archivist and information services manager for the Ford Foundation, and the Georgia Department of Archives and History. Williams has also been an information consultant for many organizations including Appalachian Council of Governments of Greenville, South Carolina, and Pontifical Catholic University Madre y Maestra, Dominican Republic. He came to the Chemical Heritage Foundation as the Eugene Garfield Fellow in the History of Scientific Information in 1997. He is a member of the South Carolina Historical Records Advisory Board, the American Library Association (ALA), and the American Society for Information Science (ASIS), where he served as chair of ASIS History and Foundations of Information Science Special Interest Group in 1994-1995. Williams is also a member of the Special Libraries Association (SLA) and Chair of the SLA Membership Committee. Williams has numerous publications on the historical role of information science.

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INTERVIEWER: Robert V. Williams

LOCATION: Mechanicsville, Maryland

DATE: 14 July 1997

WILLIAMS: Mrs. Henderson, I have that you were born in 1922 in Merrimac, Massachusetts.

HENDERSON: Right.

WILLIAMS: Tell me about your family background.

HENDERSON: All right. My father was a naval architect. My mother was a homemaker. My father was born and brought up in Merrimac, and I was born there, I suspect because I came a little early during a family visit to Merrimac. But our home was in Quincy, Massachusetts. My father was a marine draftsman or naval architect at the Bethlehem Shipbuilding Company, Fore River Yard, in Quincy. I grew up there.

WILLIAMS: Where had your father been educated?

HENDERSON: At Webb Institute of Naval Architecture in New York City. It's a preeminent school of naval architecture. My mother was a registered nurse in New York City. I don't know how much of this personal history you want, but my father was a born and bred New Englander. My mother was probably a second or third generation Irish-American in New York, and they met and fell in love. My father told his family that he wanted to marry this Catholic Irish girl from New York, and they wanted to know why he didn't marry an American girl. [laughter] But we had a loving family across all the generations. My grandfather lived until he was in his nineties, my grandmother died relatively young. My father was a convert to Catholicism, and we were all brought up Roman Catholic. There were four of us. I was the third child. I had an older brother and an older sister and a younger brother, all of whom are gone now, and their spouses are gone now. I have nieces and nephews, but I'm the last of that family.

I grew up in Quincy. I went to the public schools through the eighth grade, and then I transferred to a private school for girls, Woodward School for Girls. It was established by a Dr. Ebenezer Woodward for the education of young women born in Quincy, and they extended the

"born in" to include daughters of residents of Quincy, in case a woman went to a hospital in Boston or Braintree, or in my case, Merrimac. But it was a small school, college preparatory courses. I took Latin for four years, and science, English, French, and so forth. It was a very nice school and a very good education.

From there I went to Emmanuel College in Boston, which is a Catholic school, all girls, and a day school at that time. I commuted from Quincy into Boston. This was during World War II, so that in order to be able to commute, I drove fellow students. I had a car pool and you could get gasoline-rationing coupons for that kind of activity. My father, being a war worker, really, at the shipyard, of course had access to gasoline.

Let me back up a minute and tell you that during the Depression years, the shipyard established a program of part-time work, shared work I guess you'd call it now. My father worked three days a week one week and two days a week the next week, and his counterpart did the opposite. So that we felt the Depression but were never battered by it.

WILLIAMS: He was a government employee?

HENDERSON: No, Bethlehem Steel built ships for the Navy but they also built commercial merchant ships, I think probably freighters, and I remember they did a cruiseliner one time. We got to walk through the ships when they were first launched, and so I can remember that I was very impressed. It was the Matson Line, and I think that it was scheduled to sail from California to Hawaii or something like that. So that was pretty exotic.

WILLIAMS: Then you went to Emmanuel College on a scholarship?

HENDERSON: No, I didn't. I applied for a scholarship, and I got a partial scholarship, but it was a day school and my father said at the time, I remember, "We can't afford to send you away to live at college, so start out at Emmanuel and, over time, we'll see if you can't transfer." Of course, after very few months at Emmanuel I was completely enamored of that place and I didn't want to transfer. So I went all four years. Now Emmanuel does have dorms and it does have residence halls and every student has a computer in her room.

WILLIAMS: How did you choose chemistry?

HENDERSON: I'm going to show you something. I decided when I was in the eighth grade that I wanted to be a chemist. One of our assignments was to write a book, "My Career Book." I did that. I went to the local hospital and interviewed a lab technician there and I did research on salary ranges and education requirements and so forth. Eighth grade.

WILLIAMS: This is a publication dated 1936. So you decided chemistry was for you?

HENDERSON: Chemistry was for me in the eighth grade, and when I went to Woodward School I had a very good science teacher who told me to consider industrial chemistry as opposed to hospital chemistry as a career choice. So when I went to Emmanuel, I majored in chemistry and minored in mathematics. All of my other colleagues who majored in chemistry minored in biology and did go into healthcare work and hospital work and clinic work and so forth. But in my senior year—our placement bureau arranged interviews for graduating seniors—I interviewed with the DuPont Company, and I came down to New Jersey and worked for the DuPont Company Explosives Research lab during World War II. I graduated from Emmanuel on June 6, 1944. I said we were knocked off the front page by D-Day. [laughter] So, I came down to New Jersey. That was my first experience living away from home and I was pretty homesick for a while.

WILLIAMS: You were at DuPont for about a year?

HENDERSON: For one year. Yes.

WILLIAMS: Working in explosives?

HENDERSON: In explosives research. We were in the Analytical Research lab. We did analyses on research compounds. I remember one of them was caprolactam, which was an ingredient of nylon. We also did research on analytical techniques. We helped to develop analytical techniques to match the needs of the research chemists who were doing explosives work. It was a very interesting assignment. I'll tell you one thing I learned there. We had to account for our time, since the analytical lab did work for the research labs, in fifteen-minute increments, and it taught one to be very efficient and also very industrious.

WILLIAMS: This was for cost accounting purposes?

HENDERSON: Yes. The analytical lab charged the research lab so much money. The Director of the Analytical Lab allowed a certain amount of time for professional growth—you know, reading journals—and of course for staff meetings and so forth. But having to account for your time like that was a very good lesson.

WILLIAMS: You stayed there until 1945 then?

HENDERSON: Yes, one year, and I got a letter from the placement bureau at Emmanuel saying that if I was interested, there was a small lab in Quincy that needed a chemist, a junior chemist. I decided that I was ready to go home, so I did, and I went to work for another year, one more year, at Harrington Labs. It was established by a man named Valentine Harrington. He was sponsored by a local company that thought they wanted to get into the household chemicals business: cleaners, shampoos, and so forth. I can remember Harrington had worked in a lab in Cambridge, and he and his chief assistant decided to start up their own business, and found the sponsor in this local businessman who thought that household chemicals was a good place to try. I can remember the three of us in this big warehouse kind of a laboratory. We used to wash our hair every day to try the different formulations of shampoo. [laughter] That lasted about a year, and then it was much too difficult and expensive to break into the market. So Harrington Research Labs dissolved.

I, in the meantime, had had a call from a friend, a classmate from Emmanuel, who worked at MIT [Massachusetts Institute of Technology]. She had been a math major and was working in a lab at MIT and said that she understood they were advertising for a chemist and why didn't I come out and look at that, which I did. I got a job at MIT working in the chemical engineering department under Warren K. Lewis, who has been called the Father of Chemical Engineering. He had a grant from what was then Esso, now Exxon, supporting his graduate students in studying catalytic cracking techniques, particularly fluidized beds, and the chemical engineering graduate students could use the services of a chemist and a mathematician to analyze the results of their runs in these fluidized columns and to calculate their results.

I enjoyed that very much. We were in the High Pressure Research Lab at MIT, which was an old building right next to the power plant. I suppose they figured if we blew up, we wouldn't hurt anybody. [laughter] I stayed there three-and-a-half years.

WILLIAMS: You took some courses also at MIT, while you were there, in chemical engineering?

HENDERSON: Yes. Chemical engineering and physical chemistry, which was a blossoming subject then. When I was at Emmanuel, in my senior year they offered an introductory course to physical chemistry but it conflicted with my math courses so I couldn't take it, and I took it at MIT.

WILLIAMS: You were not heading for a degree there?

HENDERSON: No. It was difficult because I would have to leave work and run across the campus and sit in the class for about an hour and then run back, and the teacher, who was a pioneer in physical chemistry, had short shrift for women, I must say. This was in the days when MIT was definitely a men's college, with very few women students, and certainly none who'd come running in breathless. So it was instructive but it didn't inspire me to go on to graduate work at that time.

WILLIAMS: Was working in the lab an all-male world except for you?

HENDERSON: Yes. The High Pressure Research Lab had two machinists helping the young graduate students build their fluidized bed reactors, and me. I had several friends working there at MIT who had graduated from Emmanuel, and so I would meet them for lunch. We also had access to the dinghies on the Charles so we'd go sailing at noontime and that sort of thing. So we enjoyed it.

WILLIAMS: For three-and-a-half years.

HENDERSON: Three-and-a-half years. Then I had a letter, and I've got it in my files here, from Dr. Lewis saying that he had to cut back. He would give me three months' notice and give me any kind of help he could in finding another job. This was in 1949 and it was a semi-recession—a small period of cutback after the war was over. For the first time I had to go job-hunting, and it was a difficult time to do it because there were few jobs and there were many candidates for every job.

I ended up accepting a job in Peter Bent Brigham Hospital Surgical Research Lab and I lasted a month. [laughter] I was terribly upset about being out of work and not being able to find a job easily, and I remember my sister said to me, "You're driving around in a new car, you've got money, you're living at home. What are you worried about?" [laughter] But it just didn't seem right not to be working. So I went to Peter Bent Brigham in the lab of Dr. Francis Moore, who was a pioneer in metabolic research work. I was there about a month and I got a call from MIT saying that Professor [James W.] Perry wanted an assistant chemist; would I like to come and talk to him? I did. I guess I worked at Peter Bent the month of December and talked to Perry in January, and he said, "Start the first of February."

WILLIAMS: This is 1950?

HENDERSON: 1950. I went over to MIT and I met Perry. I have an item in my bibliography, which you might have seen.

WILLIAMS: It described that.

HENDERSON: Yes. This was something called, I think, "Scientific Information Notes," and I don't know whether it still exists (1).

WILLIAMS: I found it. It was in your bibliography.

HENDERSON: They did these personality profiles every once in a while and I did one on Perry. I can remember he said, "Well, do you want to try it?" and I said, "Yes, I think so." I had one friend who had graduated from Emmanuel the year after I did with a major in biology who got a master's in biology and then moved to Washington and went to work in the Chemical Biological Coordination Center [CBCC]. I said to her, "What kind of work is that?" Up until that time I'd been a bench chemist and I didn't believe that you were a scientist if you didn't work in the laboratory. She told me it was very interesting and very important and so forth. So when Perry said, "This is the kind of work I'm doing"—if you read that "Scientific Information Notes" profile, he had been a bench chemist and then had been steered into information work.

WILLIAMS: I don't know much about Perry's background prior to the project. In 1945 he was a Library Fellow at MIT studying problems of documentation. Do you know what happened before then, how he got into this?

HENDERSON: Well, yes. He had gotten a bachelor's in chemistry from North Carolina State and in 1931 a master's in science in chemical engineering from MIT, and then he spent a year at the Eidgenössiche Technische Hochschule [ETH]. Then he returned to the United States and went to work at the National Aniline Division of Allied Chemical in Buffalo, New York in 1934, and he was there until the war years. Then he went to Aberdeen Proving Ground, the Ballistics Research Labs, until he went back to MIT. When I met him, he had an office tucked away in the Research Lab of Electronics building.

WILLIAMS: But what I wondered was how he got the position of Library Fellow in 1945.

HENDERSON: I don't know.

WILLIAMS: Do you know how he got into documentation?

HENDERSON: No. I know that he got into documentation because, from his experience at Allied, he came to recognize the importance of the literature and information for chemical, probably any research, but in his case industrial research. I must confess, when I came there he was established at MIT, but kind of floating. You know, at that point he was attached to the Research Lab of Electronics, thanks to Jerome Wilsner. Later, when I was working with him, we moved over to the Modern Language department and the library. Bill Locke, who was a professor of languages and then director of the libraries, gave us a home in the library. Then Perry's work attracted the attention of Joe Becker at the CIA [Central Intelligence Agency] and we had a contract with the CIA that gave us a home in the Center for International Studies, which was the area at MIT where classified research was being carried on.

WILLIAMS: I was trying to straighten it out in my mind. Back in 1945, [Robert S.] Casey and some other folks— Perry's name was not on it—did that article in *Chemical and Engineering News* (2), but there was also a note someplace I've seen that said Perry was a Library Fellow at MIT in 1945. But he wasn't one of those authors of that original article in *Chemical and Engineering News*.

HENDERSON: By 1949, 1950 certainly, he was working with Bob Casey on the punched card book (3).

WILLIAMS: By 1948 he and [G. Malcolm] Dyson went to see Tom [Thomas J.] Watson at IBM [International Business Machines] about the problem of handling chemical information. So someplace in-between, he must have made a connection with Casey.

HENDERSON: I remember that an outcome of that visit with Tom Watson was that he turned us over to [Hans] Peter Luhn, and that was definitely when I was working with Perry.

WILLIAMS: Oh, it was. I know there's an article in *Chemical and Engineering News* from maybe 1952 that talks about Perry and Dyson going and talking with Watson, and that the problem was assigned to Luhn (4). But I can't remember the exact dates.

HENDERSON: Well, I can remember going to the IBM homestead in Endicott, New York with Perry, and I think Allen Kent was with us at that time, and Pete Luhn, and we spent a very enjoyable weekend discussing information problems and information processing as opposed to data processing.

WILLIAMS: You don't remember what date that was?

HENDERSON: No.

[END OF TAPE, SIDE 1]

HENDERSON: Here it is. "Two such scientists, Perry and Dyson, approached Thomas J. Watson about four years ago." This was published in 1952, so it would sound like it was 1948.

WILLIAMS: Yes. That's what I have, 1948 with a question.

HENDERSON: Yes. "Watson accepted the challenge and assigned the project to Luhn." It was soon after I went to work for Perry that that happened. So it was 1950 to 1951. One reason that I'm not so sure is that in 1952, *Chemical and Engineering News* published an article entitled, "Notational Systems for Structural Formulas," by Berry and Perry (5). I believe that it was the outcome of a paper that I presented at the ACS meeting in 1950 in which I described the work that we were doing in comparing all of the notational systems that had been submitted to the IUPAC [International Union of Pure and Applied Chemistry] Commission (6).

WILLIAMS: Right. That was your first article, was it not?

HENDERSON: I believe so. My first publication.

WILLIAMS: Now, when you were working in 1950 with Perry, did he still have the money from the American Chemical Society [ACS]? Was that the source of his funding?

HENDERSON: Yes, I think so.

WILLIAMS: I believe he got a couple of different grants from the ACS.

HENDERSON: Yes. From the ACS. They had a Committee on Punched Card Techniques and the Chemical Literature Group of the Division of Chemical Education, which then developed into the Division of Chemical Literature, and the IUPAC study of notational systems, I think, were all part of the support that he had.

WILLIAMS: I think that's right. He had six thousand dollars, I believe in 1946, and then another eighteen thousand dollars, I have, and I'm not sure of other funding. Can we back up a minute? Who was Casey?

HENDERSON: Robert Casey was a chemist at W. A. Schaeffer Pen Company in Fort Madison, Iowa, and he and Perry just were good friends and interested in this subject of punched cards.

WILLIAMS: How did the two of them, one from MIT and one from Schaeffer Pen, get connected up together?

HENDERSON: I think in the American Chemical Society. Casey served on the Punched Card Committee since 1947, and as Secretary of the Division of Chemical Literature since 1949, and Perry was a spearhead in developing that division.

WILLIAMS: Again, the 1945 article is by Casey and Perry's name is not on there.

HENDERSON: No. Casey, and [G. J.] Cox was another one. I never knew Cox. And [C. F.] Bailey, I think, were all—Casey, Bailey and Cox.

WILLIAMS: That's right. They did the article in 1945 in *C&E News*.

HENDERSON: Yes. "Described by Casey, Bailey and Cox, *Journal of Chemical Education* in 1946." I have a reference (7).

WILLIAMS: So you're not quite sure how Casey and Perry—other than they may have worked on this within the Chemical Literature Group—got together at this time.

HENDERSON: We used to meet Bob Casey every year at ACS meetings. He cut quite a figure. He always wore a white linen suit to the fall meetings, which were usually in August or September, and everybody knew Bob Casey. He was a dear.

WILLIAMS: He was a chemist.

HENDERSON: He was a chemist with Schaeffer Pen.

WILLIAMS: Had he had some kind of library training or documentation training?

HENDERSON: I don't think so. I think that this is what happened in those years, that chemists who had information problems and tried to tackle them were a relatively small group and they would get together at, for example, national meetings of the American Chemical Society, which were held twice yearly, spring and fall. He had a B.S. degree from Trinity College in Connecticut, and an M.S., and he attended Columbia University. Bob was a research chemist; he developed Scrip writing fluid. He was successively manager of the Scrip factory, manager of the research laboratory, director of research.

WILLIAMS: This is from the first edition, right?

HENDERSON: Yes, of the punched cards book (3).

WILLIAMS: Unfortunately, I have not been able to get my hands on a copy.

HENDERSON: I'll lend this to you and you can send it back.

WILLIAMS: I just wanted to try to get some of the background. Let's go back to 1950-1951. You did that first article.

HENDERSON: Let me tell you first, when I went to work for Perry in February of 1950, he showed me the manuscript for the first edition of the punched card book and said, "This is a good introduction to the field that we're working in, read it, and while you're at it, edit it." He then went off to ACS meetings and left me for the first four weeks that I went to work for him. I was alone reading this book manuscript, and it is an excellent introduction to the field and the problems that people were trying to solve. He acknowledges that in the preface. "Miss Madeline M. Berry contributed skillful assistance in checking the manuscript and reading proof," and his secretary was Alice Perry. For a while we had an office of "Perry, Perry and Berry."

Then the chemical notation competition, perhaps, heated up or expanded and he gave me the job of shepherding that study. We came up with a list of seven hundred plus compounds that we asked each inventor of a notation system to convert to their notations. They sent them in to us and we compiled a book, several inches thick, mimeographed sheets, of the chemical abstracts, compound name, structural formula, and the nine serious notation schemes.

WILLIAMS: IUPAC had already come out in favor of Dyson's formula, as I recall.

HENDERSON: IUPAC was certainly more favorably inclined to Dyson because it was more chemical than anything else, and it was more highly developed than any of the other systems and also familiar to chemists—chemically familiar. In the U.S., and especially among the people who were using punched cards, [William] Wiswesser's was the favorite notation because it could be used with a machine. Chlorine was the capital letter "G". Dyson wanted to call chlorine capital C, lower case l [Cl] like we always did, and that's why he and Perry went to IBM because at that time, IBM equipment could not handle upper and lower case, and could not handle subscript and superscript. Wiswesser had in effect converted the thinking to the available cards and Dyson wanted to convert the cards to his notation.

IUPAC was headquartered in Europe. Dyson certainly had better access to the people that worked there. He appealed to the chemists who were part of the IUPAC Commission. I have a picture of the group of them and I have the original of this somewhere. We had a meeting at MIT. Yes, I have the picture here.

WILLIAMS: Oh, with signatures and everything on it.

HENDERSON: It included the editor of *Beilstein*, the organic chemical compilation, and the editor, Eric Pietsch, of *Gmelin*, which was inorganic chemistry. Karl Heumann by this time, I believe, was the director of the Chemical Biological Coordination Center, and Harriet Geer, in the front row, was his chief chemist. In the second row, the young looking man with the glasses is Bill Wiswesser. Next to him is Perry, then Austin Patterson.

WILLIAMS: What is the date of this meeting? This photograph?

HENDERSON: Let me see now. It was the summer of 1951. I went to work for Perry in February of 1950, and in September of 1950 we did this paper at the Division of Chemical Literature (6). It was a measure, perhaps, of Perry's attitude that he would allow me to give this paper before a national meeting of the American Chemical Society so quickly after joining him.

WILLIAMS: Now, this had all been preceded by your evaluating the various IUPAC systems.

HENDERSON: We were in the process at that time, and there were obviously strong contenders and weak ones. The Chemical Biological Coordination Center did the seven

hundred compounds, but they had a strictly numeric system. Each molecule or molecular fragment had a numeric designation, and when they did their coordination studies, they would run their chemistry for the numeric sequence, and then they would run their biology cards for codes for the biological tests and compare them to see which compounds had been tested for biological activity.

WILLIAMS: What machine were you running this on?

HENDERSON: Our compilation was strictly typing. People would send in these codes to us, handwritten or typed out, and we'd compile them that way. But the CBCC, I think, was strictly accounting or tabulating equipment. The Division of Chemical Information celebrated its first fifty years (8).

WILLIAMS: Dr. [Val] Metanomski sent me one.

HENDERSON: I sent him a copy of that picture. So this tells you how Casey, Bailey, Cox, Perry, and all got together. See, 1943 was the Chemical Literature Group in the Division of Chemical Education, and by 1950, the Division of Chemical Literature had sessions at each of the national meetings.

WILLIAMS: The paper that you all did was to evaluate the various systems and try to come up with some estimate of the best one?

HENDERSON: Yes, but our job—Perry and Berry at MIT—was to collect and compile this book of all of the notation systems that had been submitted to the IUPAC so that the IUPAC Commission could make a decision, and they did select Dyson as the standard for a national/international notation system. But in the meantime, chemists in the United States were using the Wiswesser system. So it was kind of a hollow victory, I think. Dyson came over to the U.S. then to be director of research at Chemical Abstracts [Service], but fairly quickly they were able to get into a registry system of molecular fragments. They were certainly at this point experimenting with early computers, and I think the registry system was numeric.

WILLIAMS: Right. That's not until about 1960 or so?

HENDERSON: IUPAC made its declaration in September 1951. Wiswesser published his line notation system anyway.

WILLIAMS: Apparently that decision on the Dyson system really made chemists like Wiswesser really unhappy.

HENDERSON: Oh yes. He felt that he had not been given the proper respect, because he had preached that we have this equipment. It was, in my estimation, kind of pre-ordained that it was going to be that way, and yes, it made Wiswesser unhappy, but the fact is that his system was being used in chemistry labs around the country. I don't know when, if ever, the Dyson notation was used. In any case, it was the beginning of the refinement of the *Chemical Abstracts* registry system.

WILLIAMS: Right. I think that sort of wiped out all those other systems.

HENDERSON: Yes.

WILLIAMS: Though Wiswesser is still being used, apparently. Or extended.

HENDERSON: Oh, yes. With small installations, you know.

WILLIAMS: I know [Eugene] Garfield said that he used it in the *Index Chemicus* originally. Of course, we're talking about the early 1960s there.

HENDERSON: Yes.

WILLIAMS: What other kinds of problems were you working on when you were still at MIT?

HENDERSON: We began to explore semantic factoring. We wanted to express the meanings of terms, not just the sound of terms, in chemical indexing and literature analysis. We felt that one of the problems that people had in using the literature was to find the right word, or the right meaning of the right word, in searching indexes and in indexing material.

WILLIAMS: Talk about the origin of that concept. When do you recall that it first was discussed?

HENDERSON: Perry and I, and then later Allen Kent, used to sit around and talk for hours about what the problems were and the concept of analyzing the semantics, the meaning of words.

WILLIAMS: Was this strictly in chemistry or across the board?

HENDERSON: It started out in chemistry, because we were chemists. But any chemist has a vocabulary of all science and technology. We had been using words that we had, like in an index to a book like this or looking through the chapters of the punched card book and so forth, and we decided that we needed a collection of terms that were realistic. So in the fall of 1951 Perry sent me to Washington to tell the information specialists working in Washington what we were about and to collect lists of terms that were in actual use in various information units around the Washington area. The one thing that was obvious, and I have said this in different publications, was that librarians were not involved unless they were unusual, like Ralph [R.] Shaw, the librarian at the Department of Agriculture. Most librarians were pretty conventional and traditional.

WILLIAMS: Traditional in what way?

HENDERSON: In that they were committed to the Dewey Decimal classification system and catalog cards arranged in certain ways and using card catalogs to search for documents or for books.

WILLIAMS: Now is this true in the special libraries of government and industry in your experience?

HENDERSON: To some extent, because a lot of the impetus for the development of new techniques came from the working chemists, and certainly in Washington, the STINFO [Scientific and Technical Information] people were a distinct community from the library people. Most agencies had a staff of scientific and technical information people with their own classification schedule in the Civil Service, as opposed to a staff of librarians who had a different classification schedule. There was rivalry between the two, but very little meeting of the minds. There was a tendency on the part of the library community to at least disregard, if not "pooh-pooh," the work of the information specialists, and there was a tendency on the part of the information specialists to feel that only they knew what they were doing.

[END OF TAPE, SIDE 2]

WILLIAMS: We were talking about the relationship between the science people and the librarians.

HENDERSON: Yes. When I went to Washington to pick up these lists of subject heading terms in 1951, I went to the Department of Agriculture Library because Ralph Shaw was the librarian and he was experimenting with the Rapid Selector. But otherwise, I went to places like the librarian at NIH [National Institutes of Health] and he, Scott Adams, was fairly traditional at the time. I went to the [National] Bureau of Standards [NBS], where [W. A.] Wildhack, the physicist, was experimenting with indexing systems for instrumentation literature. I went to the Navy library, Ruth Hooker, and to the Library of Congress Navy Research Section, which was headed by Dwight Gray at the time, and which eventually was folded into ASTIA [Armed Services Technical Information Agency]. I went to the CBCC, and I went to New York. All of this was to collect lists of subject headings or classification schedules or something that would give us terminology that was actually being used by people who were indexing or classifying or categorizing scientific and technical information documents.

WILLIAMS: All this was initiated by this thinking about how to describe things?

HENDERSON: Yes. Then I spent a couple of weeks at the Welch Medical Library with Sanford Larkey and Gene Garfield. I was down in Washington two weeks, and I went around Washington with Lea Bohnert, and she was the one who introduced me to Ralph Shaw. But otherwise, I spent some time with chemists at the Chemical Biological Coordination Center and the Patent Office.

WILLIAMS: This is your report that you prepared (9)?

HENDERSON: Yes, and I don't know what to do with it. You say, "What are you going to do with your papers?"

WILLIAMS: Keep it in your papers.

HENDERSON: Yes. I look at it and I think, "Who cares?" I've lost Appendix B, which was a list of the lists that the people actually handed us. I suppose that what happened when I went back was that I took that off for some other use. But it was a list of subject headings used in various places. We put them all together when we got back to MIT and came up with our dictionary that we were going to use to analyze terms.

WILLIAMS: So this is all initial thinking about semantic factors.

HENDERSON: Yes. What we wanted to do was to analyze terms that people were actually using rather than to do anything with Webster or just to make up our own terms.

WILLIAMS: The purpose was thinking about the semantic factoring idea specifically, or was that still a term that had not yet come to be developed by you and Perry?

HENDERSON: I'm not really sure when we started to use the term, "semantic factoring," but we certainly were talking about semantic factoring in the early 1950s. The article in *Chemical and Engineering News* described early stages of semantic analysis (4). We called it, "Definition and Systematization of Terminology," in this article in *American Documentation*. It was based on a paper that Allen and I presented before that Symposium at MIT in 1952 (10). This is a good sentence: "The need to analyze terminology for our purpose arises from the fact that practical searching machines based on modern electronic techniques are able to identify sequences of symbols but are not able to interpret the meanings of words." We said that we wanted to make the meanings explicit. This article is in *American Documentation*, volume five. We published ten papers in *American Documentation* over time, and they were bound up in the book, *Machine Literature Searching* (11).

WILLIAMS: I have a copy of all of them.

HENDERSON: There was another paper, "New Tools for the Resurrection of Knowledge" in *Chem Engineering News* in 1954 with a picture of the three of us at Battelle [Memorial Institute] (12). The specific phrase, "semantic factoring," appears in that article.

WILLIAMS: I read that one. Before we go to Battelle, let's go back to your impressions about librarians versus the science people, particularly the science documentation people. You described the librarians—even the special librarians—as traditional. What do you mean by that exactly?

HENDERSON: Without trying to denigrate, or to be pejorative or anything, the librarians traditionally were concerned with classifying or categorizing books or documents, and the information specialists were trying to get at the information contained in the documents. So the cataloguing of books and the indexing of the contents of either books or, particularly, the technical reports that were burgeoning in the federal sector, were two different processes. The reason that a lot of chemists and information chemists—information specialists who could or

could not be the special librarians—got involved in the indexing was that the company reports were not being used to advantage in the company's research efforts.

WILLIAMS: Because they were not in the libraries, or the librarians didn't want to have anything to do with them?

HENDERSON: They could have been filed in the library, but you couldn't get at the information in them unless you knew the title or the author or a date or something like that.

WILLIAMS: If they had done subject analysis, they would have used Library of Congress subject headings?

HENDERSON: Yes, and they would have done, "This report is about Subject A." But they didn't get into the chemicals that were used and the reactions that were described or the equipment that was described or something like that.

WILLIAMS: There was a phrase bandied about in the early 1950s by the special librarians that "documentation was special library work done by amateurs."

HENDERSON: Yes! [laughter]

WILLIAMS: Do you remember that phrase?

HENDERSON: I agree that that was certainly an attitude on the part of both sides. The sci-tech information types, the STINFO types in the federal government, had no training in library techniques or processes. So they reinvented wheels, and Lea Bohnert was a good observer of this kind of activity. She was trying to tell us over the years that there is more similarity between the two camps than differences, if we would only learn to talk each other's languages.

WILLIAMS: Let me try this assessment on you. It seemed to me the librarians generally, including the special librarians, lacked the subject knowledge.

HENDERSON: Yes.

WILLIAMS: Is that generally the case?

HENDERSON: Generally, even the special librarians lacked the subject knowledge or the appreciation of the need to get at the details as opposed to the physical embodiment. Let me digress time-wise to a more recent case. There was in the federal sector, and it was in the late 1960s, maybe even 1970s, COSATI, the Committee on Scientific and Technical Information. COSATI did some very interesting work on standards. They developed a standard report format. They developed a standard documentation page to be included in the back of federal reports that was almost a version of Perry's telegraphic abstracts. They did a standard format for recording the identification and indexing of federal reports based on the ANSI [American National Standards Institute] standard format for information interchange, ASCII [American Standard Code for Information Interchange]. At the same time, the library community, headed by the Library of Congress, was developing a standard format for the cataloguing of books based on that same ASCII. Henriette Avram and I used to have a go at it every once in a while. She wanted to know, "Why don't you people use MARC [Machine Readable Cataloguing]?" I said, "Because the purpose of MARC is different from the purpose of the COSATI standard, which is for indexing the content of technical reports." MARC has subject headings, but they are standard subject headings, more general, and MARC has to be concerned about the accuracy of the heading for author, for example. The COSATI report people, some of them, got all wound up in that kind of thing. "We have to be sure that Madeline M. Berry is Madeline M. Berry every time, and not just Madeline Berry or Madeline Berry Henderson or something." I used to argue with them along the lines of: the author in a technical report—a federal contractor's report to the federal government for example, or a federal agency report—is just one of the clues that we use. The place where the work was done, the contract number, the sponsoring agency, the headings that were assigned to the report by the authors when they did this documentation sheet, all taken together, can lead us to the report, and it doesn't matter whether it's Madeline M. Henderson or Madeline Berry Henderson, because we'll get it.

Now I can remember an answer by the one of the cataloguers at NTIS [National Technical Information Services]. "There are two mathematicians at Harvard, and you don't want the father's work if you want the son's work." I said, "I wouldn't base a whole system on that unusual circumstance."

WILLIAMS: What was Mrs. Avram's response?

HENDERSON: Oh, she didn't believe it. My feeling was that there were two parallel standards: one for the cataloguing community and one for the indexing community, and since they were both based on the standard format for information interchange, they could be consulted, but they didn't have to be one. I never convinced her and she never convinced me. I did a book review, a few years back, of the standard "Cataloguing Guidelines," for *Information Processing and Management*, and for the *Government Publications Review* (13). I said that it was important for anybody who did cataloguing or indexing of technical reports to have that

standard. The Anglo-American Cataloguing Rules [AACR] form of the "entry when known" is included so you could go back and forth. A man named Tim Dempsey wrote a letter to the editor of *Government Publications Review* saying that it was too bad that there was this second standard—one standard is enough—and he said, "The Corporate Author Authority List will be useful only for a neglected group." I in turn wrote a letter to the editor saying that I was sorry to read that, because I think that the AACR-2 rules expressed in the MARC format using the Library of Congress name authority files are recognized standards followed by many librarians, but COSATI descriptive cataloguing guidelines expressed in the COSATI format are also followed by many librarians and information specialists in processing technical reports.

I had arguments with the people at GPO [Government Printing Office], who have more technical reports than anything else, but try to force them into the AACR-2 cataloguing guidelines, and in my estimation, spent too much time and effort standardizing things that didn't need standardizing. The Corporate Authority list, I think, was important for identifying "National Bureau of Standards, Institute for Computer Sciences, Computer Information Division" in a standard way. I thought those were just as useful as the AACR-2, cataloguing guidelines for names and so forth.

WILLIAMS: Now, back to the 1950s.

HENDERSON: But at that time, in the 1950s, there were all these amateurs being pressed into service in the federal agencies to produce technical reports and make them available both within the agency and outside the agency. The COSATI panels were trying to standardize both the look of the reports and the content and the way that the contents could be used.

WILLIAMS: In your view, was any satisfactory arrangement ever made between these two camps in relation to this issue?

HENDERSON: I don't see it yet, and I've been out of the picture now for about ten years since I stopped consulting with the technical reports processing agencies. It's the CENDI group: Commerce represented by NTIS; [Department of] Energy represented by the people down in Oak Ridge; NASA in the NASA STINFO activity in Maryland; and [Department of] Defense, by the Defense Technical Information Agency Information. They have a structure now, this CENDI group, that meets regularly and talks about common problems, but when I was consulting with them and coming up with cataloguing guidelines, the "Data Element Dictionary," I was saying to them, "You've got so many common data elements, you should call them the same thing and use them the same way." I even said to them, "You should take a page from the library community's book and do cooperative cataloguing." Whoever produces a report catalogues it into the database, like OCLC [Online Computer Learning Center] was. The agency that wants that report for its community looks at it and says, "Okay, but I want to add something else." Or, "I don't need these." So they take that record intact or supplement it into

their files. Cooperative cataloguing. I was a member of the Task Force on Automation of the Federal Library Committee and I can remember Russell Shank, librarian at Smithsonian, telling me that he wanted to get the Smithsonian library into OCLC. I said, "Before you do that, unilaterally, let's try and get the community into it, and there would be a federal library node on it." We talked to librarians who said, "It won't do us any good. Our collection is unique." We said, "Let's try it. Let's have a little experiment." The first time that they put an OCLC connection, I think, into Washington, the librarians catalogued and looked at the cataloguing records of others. They were astounded by the similarity or duplication, if you will. Nobody was saying you should not have these books or reports or whatever, but why catalogue them twice? There is, I believe, a very successful federal library cooperative cataloguing operation.

WILLIAMS: Why wasn't NTIS the solution early on to this problem? They were the center for all of the reports coming in.

HENDERSON: NTIS would get tapes from the other agencies, and they would combine them, I think, and yet when they got reports in, they'd catalogue them again. There is a mindset on the part of all camps.

WILLIAMS: The "Not Invented Here" syndrome?

HENDERSON: The "Not Invented Here" syndrome. "Only I know what's necessary!" Another small example: when Perry and I and Allen Kent—when Perry, Berry and Kent—had a contract with the Army at Aberdeen Proving Ground, the Development and Proof Services, we initiated telegraphic style abstracts to be attached to each report that was sent in to the library, and the ordnance materiel under test, the kind of test, the equipment used, the—I don't know whether we called them "important terms" or what—were recorded on these forms. You can find that article about telegraphic abstracts in the *American Documentation* series. Also, I described them in the paper I gave in Columbia in 1993 (14). None of the librarians at Aberdeen Proving Ground, Development and Proof Services Library were librarians. They were records clerks, women who had come to work at the Proving Ground and gotten into the library as a good place for women to work.

[END OF TAPE, SIDE 3]

WILLIAMS: You were talking about the project at Aberdeen Proving Ground.

HENDERSON: Yes, and we even had these abstract forms duplicated on large McBee Keysort, edge-notched cards. We did it as an experiment that the librarian would take those cards and

notch around the edges for the materiel and the type of test and so forth. The librarians, the records clerks, that were keeping the firing records, for example, and the women who were analyzing the technical reports on tests of self-propelled vehicles or tanks, much heavier reports—firing records tended to be one or two sheets—all felt that they knew what needed to be recorded as index entries because they knew how people came and asked for things. We said, "If you are more flexible, you may be able to find things, no matter how people ask for them." How do I explain this? It was a circle. People went up to the library looking for things and asked for firing records of a certain piece of materiel because they knew they could get it from that piece of materiel. Then they had to look through the firing records for what information they wanted. Whereas, we were trying to say, "If you do this multidimensional indexing, you can get the firing records from any one of a number of ways, and your clientele will learn that they can ask for them in a number of ways."

WILLIAMS: Whose system was this that you were developing?

HENDERSON: Perry, Berry and Kent were at Aberdeen Proving Ground on a contract with the Development and Proof Services to try to help them improve the management of their own information. It was their own technical reports that they wanted to improve access to. They did this because one time they found that they had gone through a complete testing of a tank, durability and terrain, and all that sort of thing—which costs some amount of money, time and engineers and personnel and running the thing—only to discover that that same tank had already been completely analyzed and tested. They didn't like wasting that kind of money. Another time they found that a man, one of their firing range engineers, was killed when a piece of materiel—and I'm not sure whether it was ammunition or a grenade or something like that—blew up. There was information in their files that said that that lot number of that piece of materiel is faulty, but nobody told the engineer. So that both the money wasted and the life wasted weighed on the Director of the lab and he called us. We were at Battelle at the time and he came to us and we had a contract. A byproduct of the telegraphic abstracts was that we suggested that they bind up in a monthly abstract bulletin the copies of these telegraphic abstracts and management loved that because there they had a current snapshot.

WILLIAMS: When you made a recommendation for the Aberdeen project, was it for a particular system? You said "edge-notched cards." Was that the outcome there?

HENDERSON: Yes. For firing records, we recommended that they do these edge-notched cards because all the time that we were there, we were collecting terminology and trying to analyze it, and doing tabulating equipment runs, and saying that if we were to establish a machine system, you could use these factored terms and get better retrieval. What happened was that Perry got an offer from Jesse Shera to open the Center for Documentation and Communication Research at [Case] Western Reserve [University].

WILLIAMS: So the Aberdeen thing was a Battelle contract.

HENDERSON: It was a Battelle contract, and I stayed on at Aberdeen when Perry and Kent went to Western Reserve.

WILLIAMS: All right. Can we go back now just a little bit? Why was the decision made to leave MIT and go to Battelle?

HENDERSON: Perry could not get tenure at MIT because he didn't belong to any one department. He was in the Research Lab of Electronics for a while, and he was in the Modern Language department, and he was in the library. But he felt insecure.

WILLIAMS: Despite all these publications.

HENDERSON: I said to him, "You may not have stability, but you have security in your reputation and your position in the field." But he wanted the stability.

WILLIAMS: What was your status? You were a research assistant?

HENDERSON: I was a research assistant. I really shouldn't bother you with this, but I have all the documentation to prove it. I was a research assistant in the Modern Language department.

WILLIAMS: Kent was the same?

HENDERSON: I'm not sure. I was Research Assistant in Modern Languages starting on February 1, 1950. Then on July 1, 1951, I became a Technical Assistant in Modern Languages, and then beginning in October of 1951, I became a Staff Member of the Division—it's called "DIC", which was the Division of Industrial Cooperation—and I think it was because the money was coming not from MIT, but from contracts. Each of us got a personal service contract with the Central Intelligence Agency, in the Center for International Studies, where all the MIT classified contracts were. And then Battelle, July 1, 1953.

WILLIAMS: So the lack of tenure possibilities at MIT carried significant weight?

HENDERSON: It weighed on Perry more than I thought it had to, but on the other hand, that was the way he felt.

WILLIAMS: Kent was already on staff with you all at MIT?

HENDERSON: Yes, he came from Interscience Publishers, I think, and he learned about Perry's work and was interested in joining him. We went down from Cambridge to Washington to work on the CIA contract. After working for a while in Cambridge, I think Joe Becker felt that it would be useful for us to be right there.

WILLIAMS: Becker was at the CIA at that time?

HENDERSON: Yes. He was, I believe, the librarian at the CIA. One of the things that we were talking about was the semantic content of their terminology. But also, Perry was exploring the idea of audit trails from one document to another. The CIA analyst would read these reports that came in from employee staff out in the field, and they would mention names and places, and then the analyst would like to be able to find out if that name or that place or that organization had been mentioned before. There was both the tendency not to worry about it—"I'm working on this report"—and the difficulty to try to track down. But I never heard any more about audit trails in that sense, except that if you had a collection of technical documents like they got to work on from Western Reserve with the American Society for Metals [ASM], then you could trace documents that were connected. Now we do it with hypermedia. But many things that Perry did and thought about were before his time, not only as concepts but in ability to do anything about it. We didn't have the equipment. Even when we had computers, we didn't have the memory, the storage capacity, which people take for granted now.

WILLIAMS: Let's talk about the telegraphic abstracts you've mentioned several times, here from the 1997 perspective. Reading about those, they strike me as tremendously complicated, with all that code.

HENDERSON: The encoded telegraphic abstracts that they used at ASM—I have to agree with you, I think they got complicated. The fact is, though, that even Uniterm, the Documentation Inc. Uniterm system, when it got applied to larger collections, needed to be modified with links and roles. The people at DuPont came up with that activity. Calvin Mooers' zatocoding worked very well in small, compact, if you will, collections. But when you got larger collections, those systems broke down and Perry and Kent, as they continued the semantic factoring activity at Western Reserve, felt the need for these infixes and symbols that said the links and roles, in effect. The telegraphic abstract—I see it as an embodiment of the

documentation page in the back of a technical report. The utility of it is that you can see at a glance what the report is about. Of course, it's only as good as the people who write it, but it's got an abstract, it's got subject terms, and our thought for the telegraphic abstract in this form and for this report documentation page was that it would be an aid for the indexer. The trouble is that the women at Aberdeen felt that they knew how to file this firing record and how to index it better than the engineer who worked on it. I'm pretty sure that a lot of indexers of technical reports ignore those documentation pages. But the picture of a telegraphic abstract of an ASM document is very daunting. In some respects it looks like the input of a document in the SGML [Standard Generalized Markup Language].

WILLIAMS: SGML. Right. And HTML [Hypertext Markup Language] also.

HENDERSON: Yes, with all of the symbols and so forth. I think the idea of expressing the meanings of words is a good idea and a valid idea, but the embodiment of it at that point in time was kind of torturous.

WILLIAMS: But its purpose was condensation of information, both semantic factoring and telegraphic abstracts?

HENDERSON: Yes, and indexing with links and roles. I remember at DuPont they wanted to be able to designate for their chemical reports files starting materials, catalysts, end products, reaction type. The words themselves didn't make clear what were the links and the roles of these different individual terms, and they didn't worry at that point about synonyms or near-synonyms, which Perry was trying to take into account.

WILLIAMS: All of this was designed basically for unit record equipment.

HENDERSON: Yes, and Perry built his own searching selector, his own computer.

WILLIAMS: The Western Reserve University Searching Selector?

HENDERSON: Yes. Because the Luhn Scanner promised possibilities, because it looked for strings of symbols and a number of units in a single pass and that sort of thing.

WILLIAMS: Why do you think the idea behind the Luhn Scanner didn't go on and develop?

HENDERSON: At the same time, the general-purpose computers were developing. Special purpose computers of varying kinds fell by the wayside in favor of general-purpose computers that were becoming more flexible, becoming cheaper, having more storage capacity. Everything that we wanted was coming down the pike.

WILLIAMS: When you say, "fell by the wayside," you'd put in there the Western Reserve Searching Selector and the Luhn Scanner?

HENDERSON: Yes, and GE [General Electric] was going to make a searching selector or searching machine based on it. You think of things like the Rapid Selector, the Magna Card, the IBM Walnut, all the things that were going to move little pieces of film and stuff like that. As magnetic storage became greater, greater capacity, lower cost and so forth, these other developments were no longer attractive.

WILLIAMS: Well, in that regard, does that mean that semantic factoring and telegraphic abstracts as ideas were worthy only in terms of those machines, or was it possible to carry them over to the general purpose computer?

HENDERSON: I think it was possible. I think that ASM's files went onto general-purpose computers. I think that the idea of analyzing terms and recording terms in terms of semantic units was probably more expensive than the value of being able to search the semantic content. We've gone through a couple of cycles certainly in our profession. We espoused full text searching, never mind the terminology. If you had the whole text to search through, you could come up with what you want, and it didn't always work. Full text searching was not the answer completely. Weighted terms, according to how frequently or how close together or whatever weighting, does some good. I'm taking a class on Office Suite for Windows 95, and I went to a class also on searching the Internet. The teacher said, "Now, if you search for this information, you come up with a list that says, 'Here are the first twenty of the four hundred fifty that answer your request. The first twenty are most relevant.'" He said, "I don't know how they do that," and I thought, "We've been spending years trying to decide how to tell somebody that these answers are the best that you can expect." All the way back to Cyril Cleverdon.

WILLIAMS: Yes, very definitely.

HENDERSON: Yes, so we are still concerned. When I gave my paper in Columbus in 1993 (14), I said at the time that some of that semantic analysis was still being done today. The [National] Library of Medicine [NLM] is doing work that includes semantic analysis and

somebody at *Biological Abstracts* was talking about semantic factoring. Terminology is still of concern.

WILLIAMS: How do you tie those two to vocabulary control?

HENDERSON: I think it's just a method of vocabulary control. If you say, "I'm going to record this term in the form of semantic factors," then you're free to put together the semantic factors as you see fit for your collection or your vocabulary. Otherwise, the vocabulary control says, "If you have this kind of a term, you use this." I think it's a method of vocabulary control. There were two camps in our profession: one that said you don't need vocabulary control, and another camp that said you need very tightly controlled vocabulary control.

WILLIAMS: Where did you place yourself?

HENDERSON: I am more comfortable with vocabulary control, but I left semantic factoring when I left Perry and Kent. Their embodiment of semantic factoring got, in my mind, too complex.

WILLIAMS: Too complex to be practical?

HENDERSON: Yes—too complex to be practical. I preached vocabulary control to the CENDI agencies in the sense of, "use the same." All of you get together and decide what your data elements are and how you define them, and then you use those data elements according to those decisions that you make. I think over the years that I have been more concerned about standardization of whatever form, standard format, standard vocabulary, standard cataloguing rules, as a way of contributing to the control.

WILLIAMS: Where did you see people like Mrs. [Claire K.] Schultz and her work on counting, doing word counts and such? Did you see her in either one of these two camps that you mentioned?

HENDERSON: Well, I think that that is a version of the work that [Gerry] Salton did with the SMART system where he was doing "frequency counts". People are still doing a lot of very technical work in word counts.

WILLIAMS: Much akin to weighting of terms.

HENDERSON: Yes, and the weighting of terms, and so forth. Mort [Mortimer] Taube started out with the Uniterm system saying, "You pick the words out of the document and don't worry about synonyms or near-synonyms or standard terms." As people began to apply that, especially to larger collections, they had to standardize, they had to insist on vocabulary control or it just got out of hand.

WILLIAMS: Yes. Let's go back. What brought you initially to Battelle? Was it the CIA contract? There was a period in which the three of you were in DC working on the CIA contract?

HENDERSON: Yes.

WILLIAMS: Before Battelle?

HENDERSON: Yes.

WILLIAMS: How long a period was that?

HENDERSON: Six months or so. I think that somebody at Battelle persuaded Perry to come out. I have to tell you I'm not sure how it came about, who initiated the discussion. Anyway, I think that Perry saw that as a way of stability. The CIA contract would end, and there was nobody urging him to go back to MIT.

[END OF TAPE, SIDE 4]

WILLIAMS: Anyway, all three of you moved.

HENDERSON: All three of us moved to Battelle, and Battelle was a contract research organization. I used to say to Perry and Kent, "You spend all of your time selling contracts, and then I have to do the work to service the contract." That's what happened with the Army.

WILLIAMS: The Aberdeen project.

HENDERSON: I actually moved down to Aberdeen.

WILLIAMS: Oh, you did.

HENDERSON: I had been renting a room in Columbus. Perry's family was there and Allen's family was there, but I was just renting a room. When they got the Aberdeen contract, which was a fairly substantial one with long-term possibilities, I moved down to Aberdeen and worked with the women in the library and with the engineers, trying to bring the two together. Perry and Kent would come down maybe once a month and I'd bring them up to date on where we stood and what we were doing and so on.

WILLIAMS: When you said, "women in the library," these were not really MLS or BLS folks?

HENDERSON: No. These were the records people. I think there was one woman who had a bachelor's in library science. Now, across the post in the Ballistics Research Laboratories, they had a *bona fide* library staffed by librarians.

WILLIAMS: How long were you in Aberdeen?

HENDERSON: Long enough to meet Dick Henderson. [laughter]

WILLIAMS: Because you left Battelle in 1955.

HENDERSON: Yes, and I went to work for the National Science Foundation [NSF] in 1956. We left Battelle in 1955, but I had been down there for a year, and really lived there full time.

WILLIAMS: This is where you met Mr. Henderson?

HENDERSON: Yes.

WILLIAMS: What was he doing?

HENDERSON: He was an engineer in the Army with the Development and Proof Services, responsible for testing of tanks and self-propelled vehicles. I interviewed him as one of the engineers, that I was asking, "What are your information problems?"

Let me digress just a moment. I can remember Perry talking to Norbert Wiener at MIT—Norbert Wiener is the father of cybernetics—about information problems, and Norbert said, "I don't have any information problems. I know what I need and I know what's going on." Of course, he was the core of a very small, highly select, invisible college. He didn't have any information problems! [laughter]

WILLIAMS: They were all right down the hall from him!

HENDERSON: Or, even if they were across the world, they kept in touch with him. It's like what the physicists had, an invisible college where those physicists working on particular problems would exchange papers.

WILLIAMS: Is it like this in chemistry, which is the leading area in documentation, information handling? Or is chemistry more diffuse?

HENDERSON: There are so many chemists and their interests are so diverse, and yet the common threads are so important. If you are working in rubber chemistry and I'm in some kind of plastics, what we're doing has more relation than it used to be. Now, chemists are taking molecules apart. But in the beginning I think it was because chemists had an appreciation for the importance of information as embodied in their *Chemical Abstracts*.

WILLIAMS: You already had that really good system.

HENDERSON: Really good system of covering the world's literature. We had specialized coverage in *Beilstein* and *Gmelin*, and yet our own company reports or federal agency reports were not as well organized and so we felt the need to be able to get at not only the world's literature through *Chemical Abstracts*, but our own literature through indexing.

WILLIAMS: Of course, by the mid-1950s, the *Chem Abstracts* system was really breaking down.

HENDERSON: It was certainly beyond the ability of individual chemists to have individual subscriptions, and just sheer bulk.

WILLIAMS: Right, and finding anything in it. Plus, *Chem Abstracts* was running as much as a year or two behind.

HENDERSON: Yes. But it was better than most people had.

WILLIAMS: Talking about this, what strikes me is how long, about fifteen years—if we just use from 1948 to the mid-1960s—before *Chem Abstracts* is really getting automated nicely—a fifteen-year period.

HENDERSON: In which, recognize that the equipment was fairly primitive.

WILLIAMS: Is that the problem?

HENDERSON: Yes. I believe that as people tried to automate, we were using hand-sorted punched cards, tabulating cards—the Patent Office I think went to the IBM-101 statistical machine.

WILLIAMS: As did Mrs. Schultz also, with her chemistry problems.

HENDERSON: Yes. This was the time of experimental computers. The Bureau of Standards built a computer, the Pilot. Of course, Univac went into the Census Bureau, didn't it? It also was up at the Ballistics Research Lab at Aberdeen. But they were number-crunching. IBM didn't see the market for letter-crunching, if you will—word crunching. I did an obit for Calvin Mooers (15).

WILLIAMS: Right. I read that.

HENDERSON: In there I pointed out that in 1964 he helped to draft the American National Standards Institute's ASCII Standard, and he convinced people that you had to be able to handle letters as well as numbers. So this was the first data processing standard to place both upper- and lower-case letters into a single standard. Otherwise, we figured we would have had different keyboards and so forth.

WILLIAMS: We were talking about why Kent and Perry went off to Western Reserve, and why you came to the National Science Foundation.

HENDERSON: I think that Perry and Kent had an offer from Jessie Shera to open the Center for Documentation and Communication Research. I assumed that I would go with them, at first, but I wasn't terribly anxious or eager. The work at Aberdeen wasn't finished, and when Battelle wrote to the Army and said, "They're leaving us, we can train new people," the people at Aberdeen said that that wouldn't be feasible so, "We'll terminate the contract." Then Allen Kent said, "You stay at Aberdeen and do the work." They would go to Western Reserve and I would stay and hold the fort at the Proving Ground so that there would be a finish to that project.

One day, I had a call or a letter from Helen Brownson saying that she wanted me to consider coming to work at the Science Foundation. At that time there was an Office of Scientific Information headed by Alberto Thompson. There was a Program for Documentation Research headed by Helen Brownson, and I think a program for international interactions of some kind headed by Dwight Gray. Helen thought that with my background from Perry and Kent I would fit in well there, and I was very excited and pleased. I finished what I could do in Aberdeen, for the several months I was still up there.

WILLIAMS: Did that project get written up someplace in a technical report?

HENDERSON: Not that I know of. I'm sure that I wrote a final report to the management, but I have to tell you that they were so pleased with the technical abstract bulletin that they really didn't care whether anything else much got done. They hired a young engineer to come in and understudy me and stay in the library after me. He was supposed to look at reports as they came into the library, the local reports, and recommend ways to index them—what to select from the telegraphic abstract as index entries for their system, which was pretty much catalogue cards. The 9 x 12 McBee Keysort cards were pretty unwieldy. I don't blame them for that. What we tried to do with the tabulating equipment, I think, might have been trying to record and sort on index entries that were assigned, but nothing really was going to happen in the library. It didn't take hold except for the telegraphic abstracts which, as I say, I think management figured they were getting their money's worth out of that, because they had this monthly snapshot of what was going on. One of the things I found was when the engineers saw their abstracts, which they figured in the beginning was kind of a bother to fill this form out and send it in with the report; having written the report, did they have to do any more? When management was so taken with the *Abstract Bulletin*, the engineers saw their words in print, and they thought, "Boy, I've got to polish this up and make it look better." So it was good on all sides, but it just didn't take hold as guides for indexing, which we had hoped the library staff might accept. So I went down to talk to Helen Brownson and Alberto and agreed to join them in something like September.

WILLIAMS: I have 1955, but don't know exactly when.

HENDERSON: Yes. This was Battelle, and this was the letter from the Director and Coordinating Director in Battelle to say that, "They're leaving, so call her." The Army hired me when we all left Battelle.

WILLIAMS: Oh, that's right. That was in 1955.

HENDERSON: Yes. Organization and Methods Examiner, Machine Methods, I think they called me.

WILLIAMS: Or Document Cataloguer is what I have.

HENDERSON: Yes. Document Analyst. Maybe that was it. Document Analyst, Machine Methods. Then Alberto said, "Glad that you agreed to come with us," and that was January of 1956. Helen Brownson said, "January of 1956."

WILLIAMS: I've been curious about Helen Brownson. How did she go from being [Vannevar] Bush's secretary to head of Documentation?

HENDERSON: She was Vannevar Bush's secretary? I didn't even know that. She moved in good circles, for one thing. She was not a scientific and technical information person, or didn't come from that background, but she learned a lot, certainly, and she was very smart and she was a very good manager. I used to say that she was consistent and she communicated well. So we always got along because I knew what she wanted done, and we worked very well together. She was one of my better bosses, certainly.

Alberto Thompson had come over from DOE, or what was then AEC [Atomic Energy Commission], and he had been, I believe, in technical information in the Energy Commission and then, unfortunately, he died of a massive heart attack just before the International Conference on Scientific Information in 1958. But he was a delight. He used to laugh with this very loud laugh. You'd hear just this explosion of laughter from Alberto.

WILLIAMS: One of the histories of information science called Helen Brownson one of the "strongest influences on the development of information science during this early period." I assume this was because the two of you had control over all of the grants being made in the field at the time.

HENDERSON: Yes. She had a budget to give grants and she gave them very wisely. The AFOSR [Air Force Office of Scientific Research] gave grants. That's where Harold Wooster was. The Office of Naval Research did some, but not as much. You're right. Helen had grant money and she used it wisely.

WILLIAMS: Did she have a good understanding of documentation for the times?

HENDERSON: I believe so. She didn't come from the hands-on background but she understood the dimensions of the problem and the need for solutions, and she listened to people who proposed solutions. One of the things that she supported that didn't sit too well with some members of the community was support for *Chemical Abstracts* research.

WILLIAMS: Yes, I want to talk to you in a minute about that.

HENDERSON: I remember Gene Garfield thought that it was terribly unfair that *Chemical Abstracts* got support to build their system, and he was struggling along a parallel track. But one of the things that I brought to her program was the background in chemical information processing and a lot of contacts in that field. She was firmly embedded—that's maybe the way to say it—in the Washington scene. People knew Helen Brownson, and she was always a very quiet, unassuming-acting person. She never threw her weight around or anything, but at the same time, she was very levelheaded and didn't get swept off her feet by a lot of people who were in the field at the time.

WILLIAMS: How did Shera and Perry get along?

HENDERSON: I think they got along very well. I really never heard what it was that caused Perry to leave Western Reserve except that he wanted more freedom to piddle around in research, to continue to think big thoughts about semantics and information. By this time, the project at Case had gotten so involved with the American Society for Metals testing that it was no longer a research project.

WILLIAMS: It was a processing project more than anything else?

HENDERSON: Yes, so the ASM people did the processing, but I think a lot of the Western Reserve staff were involved. Tefko had some interesting comments about that in his review. So

Perry went off to Arizona. We visited with him on our way back from Okinawa in 1963, and he was growing a cactus garden at that point. They moved into their home in Tucson and Ruth Perry planted gardenias in front of the house. She said the first monthly water bill was what their annual water bill had been in Ohio, so she decided that she couldn't grow gardenias.

WILLIAMS: Perry pretty much left the field when he went to Arizona, didn't he?

HENDERSON: Yes. He was doing some interesting work, but I never saw him again after 1963.

WILLIAMS: I called Mrs. J. W. Perry about his papers.

HENDERSON: What did she say?

WILLIAMS: That she didn't know anything about them. She was really very short with me on the phone, and I thought this is because she's been called before.

[END OF TAPE, SIDE 5]

WILLIAMS: Let's go back to the NSF job.

HENDERSON: Yes. One of my functions was to keep in touch with what was going on. In addition to the NSF job, I was doing this second edition of the punched card book with Perry and Casey (16). Now, how did Perry get to Washington at that time? I guess he came down from Cleveland different times, but we worked together on the book. I wrote a chapter, and I also collected chapters and so forth. In the process, I was keeping in touch with a lot of people who were using punched cards and early computers, like Claire Schultz and Gene Garfield and Saul Herner. We decided to collect this information in these two booklets that I told you about.

WILLIAMS: In the *Non-Conventional Systems* (17)?

HENDERSON: Yes, *Non-Conventional Systems*. You have Lea Bohnert's article and then this is Wooster's, about the other series, *Current Research and Development in Scientific Documentation* (18).

WILLIAMS: I've got that one. I have a copy of that.

HENDERSON: In the first edition of the *Non-Conventional Systems*, published in January, 1958, there were thirty systems and twenty-five organizations, and I visited all of them and actually saw them in operation and talked to the special librarians or the sci-tech information people that were operating the systems, and helped to produce the descriptions. But then the reports grew, I forget how many she said were in, one hundred fifty or something like that, in the last, and by that point there were too many in current operation to try to cover them all. So we quit with that series (17).

The other one, Helen sent me out to the West Coast at one point to see what was going on out there in the way of information or documentation research and I visited people like Don Swanson, Harold Borko, Bob Hayes, and Carlos Cuadra, and I saw the Magna Card. Rand Corporation and System Development Corporation and Magnavox. It was a very interesting trip and when I came back with reports of what was going on, that served to suggest that we should publish these research reports, and that was the *Current Research & Development* series (18). Over time, that got to be a big project because of trying to get people to submit their descriptions of what they were doing and coordinating the preparation. Finally, Herner and Company took on the last, I guess, six or so issues under contract with Helen.

WILLIAMS: Essentially, both of these were your ideas, the *Non-Conventional Systems* and the *Current Research*, and you were responsible for them?

HENDERSON: Yes, and I was responsible for producing them. Then I joined Dick overseas. I stopped working full time.

WILLIAMS: I have that you went overseas in 1962.

HENDERSON: Yes, well, I was overseas by then. I went over in the Spring of 1961, but I was under contract with the Science Foundation until, I guess, 1962, and I was reviewing material for Helen and I was looking at drafts of current research and so forth. But the distance was too great, and she wrote me a very nice letter saying that Burt [Burton W.] Adkinson felt that it just wasn't productive for that kind of distance.

So I came back from overseas in October of 1963, and lived in Aberdeen, and I came down one time to, maybe it was a local chapter of ASIS [American Society for Information Science], a dinner meeting, and saw Mary Elizabeth Stevens, and she said, "I want you to come to work for me like you did for Helen Brownson"—long distance. I said I'd be interested. She was working on a book, the title of which is almost as long as the book itself: *Cooperation,*

Convertibility and Compatibility Among Information Systems (19), and Si Newman was helping, and John Moats. It just wasn't getting done, and she said she wanted me to come and help put it together.

WILLIAMS: Let's come back to that story in just a minute, because I have a number of other questions about the NSF work. But I'm glad you got us to that point. In my view, this is the really critical period for the development of information science. Here you are in the office funding the stuff, doing the summaries. Talk to me about discussions, arguments, whatever was going on within your office in NSF about these terms, scientific documentation systems, scientific information systems, science of information, and information science.

HENDERSON: Several people questioned us about why we were the Office of Scientific Information. You could say "Scientific and Technical," but if you just say "Scientific Information," some people wanted to quibble and say, "What's scientific about information?" I don't know whether it was Adkinson or the Science Foundation management, but it went from Scientific Information to Science Information Services, OSIS. OSI became OSIS, and I think one of the problems was that Scientific Information bothered people, but Science Information Services made it seem more like Science Information. That's what I remember about it.

WILLIAMS: What is your first memory of when folks began to use the term, "information science", particularly in the context of NSF?

HENDERSON: I don't know that I remember using "information science" at NSF. Gene Garfield was the one that wanted us to change the name of ADI [American Documentation Institute] to ASIS, wasn't it?

WILLIAMS: I don't know.

HENDERSON: Maybe he wanted to change ASIS to something else. But I don't remember people talking about information science, as such. There was a problem with the computer types when we talked about information systems, and they meant computer-based number-crunching systems, and we were talking about library-type, bibliographic data.

WILLIAMS: Were you happy with the term, "documentation"?

HENDERSON: Yes. I have to tell you, I kind of grew up with it so I never thought too much about it. What did the people in Europe talk about? Infomatics?

WILLIAMS: Not until much later, I think. They were pretty ensconced with the term, "documentation". Certainly during the 1950s, the period we're talking about.

HENDERSON: Otherwise, I thought we were in information processing, but not the same way, not thinking about it as the computer types did.

WILLIAMS: What about philosophy in funding? What was the central philosophy in funding various projects?

HENDERSON: In the Program for Documentation Research? We would get proposals and look at them. We had Richard See on our staff and he was particularly responsible for mechanical translation research, keeping track of that sort of thing. Sometimes we would get proposals that just didn't seem to say a lot. You could turn down a proposal on the basis of not well thought out, or not valuable, or either too expensive or too small and specialized a project for us to consider. Helen kept in touch with Wooster and up at Rome Air Development Center, they sponsored research as well as did it. Larry Buckland was up there. We had staff meetings at which we would discuss different proposals. Whenever you're looking at proposals for support, you're looking at what are the other sources of support. Who else has been putting money into this? Who else could put money into this? That sort of thing. One of the problems, I think, with the *Chemical Abstracts* proposal, although it was an example of the best of information processing—collecting and analyzing and indexing and publishing indexes—it was a better-off operation than a lot of them, but it was in our estimation kind of a national treasure that could be supported and would become an example or a model for other information systems.

WILLIAMS: What or who gave you the confidence in that? Just aside from *Chem Abstracts* itself, as you say, it was a national treasure.

HENDERSON: I think that Helen was a good manager of our program and made good decisions, but it was the whole office who cooperated in examining these different proposals, especially the big ones.

WILLIAMS: Like the *Chem Abstracts*?

HENDERSON: Yes, like the *Chem Abstracts*. I think that Burt Adkinson certainly had input.

WILLIAMS: Did Adkinson have a different philosophy or viewpoint in terms of funding from NSF than Helen Brownson?

HENDERSON: Not that I am aware of. I don't remember any push-and-pull or tug-and-resist kind of attitude.

WILLIAMS: Would you describe Adkinson as a hard worker in this area, or was he more the show type?

HENDERSON: I never worked with him that much because by the time he came on board and got fully integrated into the system, I was working part time with Helen. By that time, I was living in Aberdeen.

WILLIAMS: You'd been there two years. I have that he became director in 1959.

HENDERSON: Yes, and I was there. I definitely worked under him and through Helen, with him but through Helen. So I did not get involved in a lot of the—if there was any—office politics.

WILLIAMS: You weren't in Washington full time then?

HENDERSON: I was living in Aberdeen in 1958, so I was probably there at NSF about two years.

WILLIAMS: Then working part time?

HENDERSON: Yes. Coming down once or twice a week, and doing a lot of work at home. A lot of that was the Current Research reporting type of thing.

WILLIAMS: Let's talk about the *Chem Abstracts* grants. Was there discussion about these grants before 1962?

HENDERSON: Yes, it seems to me. Was the first grant made in 1962?

WILLIAMS: I think so. One hundred ninety thousand dollars, I have, in 1962. You don't remember preliminary discussions that you were involved in?

HENDERSON: No. We talked to people. There was a lot of activity at that time, if you remember. The Science Foundation and probably Helen sponsored some of these studies of a national information system, and I think that some of that, the Crawford Report, people at the System Development Corporation, did a big study on a national information system. I remember more of that kind of thing, that kind of activity going on.

WILLIAMS: So you heard about *Chem Abstracts'*, let's say, "disagreements," with Garfield being one of those objecting to that, I guess, later on then rather than at the time?

HENDERSON: Yes. If there had been some preliminary discussion and the word got around, Gene could have been protesting before any grant. He had his *Index Chemicus*, which was never really a rival of *Chemical Abstracts*, but it was a complementary publication and he just felt that he was being overwhelmed by the competition.

WILLIAMS: I heard him say, "The non-profit organizations could get the grants and I couldn't as a profit organization."

HENDERSON: Yes. So he established the Institute for Scientific Information.

WILLIAMS: I think it was always for-profit oriented, though, wasn't it? He did later get some NIH money, so I don't know what the problem would have been in terms of dealing with that. Particularly since I was out and interviewed Dale Baker about that, I wondered, but what I read was that NSF considered the results of the grants made to CAS [Chemical Abstracts Service] for the automation to be one of their pride and joys.

HENDERSON: It certainly was a visible product, well conducted and well documented and successful.

WILLIAMS: This was in a news account, in *Chemical Engineering News*, when the suit between Dialog and CAS took place, quoting some NSF official, and this is not until 1993.

HENDERSON: There's another example of somebody suing the competition or at least beefing about the competition.

WILLIAMS: What did you think about that? Did you follow that suit?

HENDERSON: Yes. *Chemical Abstracts* has always had a certain attitude of superiority that can gall people. They were the only kid on the block for so long, and now they have really an investment in a very sophisticated, competent system, right?

WILLIAMS: All-powerful.

HENDERSON: All-powerful, yes. Yet it seems to me that they could be a little more open to cooperative undertakings.

WILLIAMS: I found it a bit ironic that Dialog was suing CAS because they had gotten public money, when Dialog was built with public money.

HENDERSON: That was the old NASA RECON. Yes. What ever happened? Did they finally settle, or are they still at it?

WILLIAMS: They settled in 1993, I believe, and spent an estimated two or three million dollars on lawyers' fees.

HENDERSON: Exactly. Nobody won but the lawyers.

WILLIAMS: That's right. I never saw that brought up, the fact that Dialog had gotten their software written with NSF money, and Air Force money.

HENDERSON: But certainly the very rudiments of their software. They went on to develop it, certainly, far beyond RECON. But see, the ACS is really a big business, but it's a not-for-profit organization and *Chemical Abstracts* is a big business, but it always was buried, if you will, in the ACS.

WILLIAMS: Oh, yes. Thirteen hundred employees, and Dale Baker said in his interview that ACS alone holds one hundred million dollars in reserve funds as a result of money from CAS. We're talking no small amount of money there.

HENDERSON: No. Exactly! It's a big business and it never wanted to be called a business.

WILLIAMS: You used the word, "uppity". That's the common word. I think that's what Dr. Garfield feels about them, too, that they felt they were just so—

HENDERSON: Superior, yes. Part of that, I believe, is the fact that for so long they were the cream of the scientific information services. When I was a chemist, before I worked for Perry and when I worked for Perry, I used to do abstracting for *Chemical Abstracts*.

WILLIAMS: You were one of the volunteers?

HENDERSON: Yes. They had volunteers, and we were dedicated. We would get our material and process it right away and send it back. It was part of being a giver of support. Jay Crane was a dear man, the editor of *Chemical Abstracts*, and Perry and I worked closely with him and with Charlie [Charles L.] Bernier in any way that we could help with *Chemical Abstracts*. But they had a production line, and until they established a research division, they really weren't moving with the times, if you will. Charlie Bernier was quite proud of the fact that he could dictate his index entries into a dictating machine and have them typed out and look them over. That was so much more efficient than having to write them down on little cards.

WILLIAMS: Did you follow those various research directors of CAS? Bernier, I believe, was the first one. Or maybe Karl Heumann was the first one.

HENDERSON: He might have been the first one. He went from CBCC. Karl was a very nice person, but not strong enough to make a difference, to really set the world on fire with research direction.

[END OF TAPE, SIDE 6]

HENDERSON: Malcolm Dyson I think was just there for prestige and to see if they could adopt his notation system.

WILLIAMS: Who really made the difference then?

HENDERSON: Fred Tate, he was the one. Fred knew where *Chem Abstracts* should go and he was going to see that they got there. He was a strong character.

WILLIAMS: I think both Dale Baker and Dr. Metanomski would give him central credit. It still surprises me how long it took them, and essentially you're talking about two or three different NSF grants, before automation is well developed.

HENDERSON: Yes. I'm inclined to compare that with what you read about the IRS [Internal Revenue Service], which still doesn't have a good computer system, and other government agencies that you know have put money into developing systems, and they have to be able to take some programs off the shelf, and yet they still haven't solved their problems. Nobody's done anything about the year 2000! [laughter] But *Chemical Abstracts* and Fred Tate were working at a time when large scale information processing systems were still being developed so there wasn't a lot of off-the-shelf pieces that could be put together. Equipment was developing so fast that if you wrote something for this machine, it would have to be re-written a year later, and programming is a very slow process, especially unique programming. If you are running a bank and you could buy a package from a consultant or a firm that's going to sell you their equipment and this package, and all you have to do is fine-tune it or tailor it to particular problems or the personality of your bank, that's a lot easier job than starting from scratch.

WILLIAMS: Writing the code.

HENDERSON: Oh yes, because the Bureau of Standards was fooling with new computers, and doing systems development and standards development, and it just seemed as though people were working for years on trying to get a job done.

WILLIAMS: What happened to that Bureau of Standards computer? All this happened before you came with them.

HENDERSON: Yes. SEAC, the Standards Eastern Automatic Computer, and SWAC, the Standards Western Automatic Computer, were overtaken by IBM and Digital Equipment and Univac. They were used in the Bureau but they were just strictly handmade at the Bureau for the Bureau, and eventually it became too expensive to try and keep them running. It was less expensive, it was certainly more efficient, to buy a mainframe for the Bureau's work. When I got there in 1964 they were fooling around with something called Pilot, which was, again, a

tailor-made or hand-built computer. There was a feeling that this was a nice exercise, but not very reasonable to hand fashion a computer for experimental work when you could get a computer. If you bought computers in those days and the equipment was upgraded, the company would come in and help you upgrade.

WILLIAMS: Before we leave NSF, I want to talk to you about one more thing. In the recent trends at NSF, we've gone from almost a total neglect of the kind of work that you were doing to, I'd call it "computer science." That is, the old information science program has become a computer science program. Were those kinds of motions going on while you were still there?

HENDERSON: No.

WILLIAMS: There wasn't another group working on information retrieval?

HENDERSON: Not that I knew of. I would think that what happened was the need for a separate program, and a program of support for science information, was overtaken by the work of people all over the country using the new, much better, equipment available.

WILLIAMS: For one example, you can still get some information retrieval work funded through NSF, but mostly what they're funding is artificial intelligence and those kinds of things. I don't know if those trends had started when you were there.

HENDERSON: No. Like the super computing centers, and all? The computer directorate, I don't remember it being in existence when we were there.

WILLIAMS: Well, it's a fairly different direction that it's gone. We've talked a little bit about how you were a woman in a man's world. Did you feel discriminated against? Let me add to this what Mrs. Schultz said, which was, "Madeline did all the work and Perry and Kent got all of the credit."

HENDERSON: Yes. [laughter] I told you that when we were at Battelle, I complained to them that they spent all their time selling us, and getting contracts, getting support, and then I had to do the work to make the systems operational, to convert the promises into fact. I certainly did a lot of the work, like collecting all those lists of terms and words, and then merging them and getting them into shape so that we could begin to actually do the semantic factoring, and then getting those results into machine form so we could print them out and look at what we were doing, and that iterative process. I certainly made the system at Aberdeen work. Perry was very

good at ideas and at expressing them. I used to complain that he tried so hard to make sure that what he said was exactly what he meant, that he got pretty repetitious and turgid in his writings. We all contributed ideas to the process of developing semantic factoring and telegraphic abstracts, but the initial kernel was Perry's, I think. He was the idea man.

WILLIAMS: Were you listened to?

HENDERSON: Well, I was listened to, yes. It was a good give-and-take.

WILLIAMS: Was Perry good at giving you opportunities, making sure that your name was on the publications?

HENDERSON: Yes. The first example that I had was the paper at the ACS that we wrote together, but I presented, and we published with my name first (5). I thought he was good that way. The one time that I was upset about not getting proper credit was an article about the telegraphic abstracts at Aberdeen, that was in the *American Documentation* series as Kent and Perry, and yet halfway through was a sample page of instructions for the engineers which said, "Call Miss Madeline Berry." I was down there doing the work, and that bothered me.

WILLIAMS: What about with NSF? Politics and such? Now, of course, you were there only part time, you said. Maybe you escaped some of that.

HENDERSON: I escaped some of that. I got on very well with Alberto while he was there; with Dwight Gray who was—I think he's probably gone now—a gentleman and a scholar; with Helen Brownson. She supported me, I supported her. I didn't have that much to do with Burt Adkinson, although he gave me a copy of his book inscribed, "To Madeline, for your very helpful suggestions when reviewing a draft of this manuscript. September 1978." That's something that I get called on to do fairly regularly. I just got a copy of a manuscript from Charlie Bourne, who's writing a book with Trudy Bellardo Hahn, of the chapter that's called "Pre-Online Searching," and he said, "Will you look it over?" I did and found several questions and several errors and I suggested that he get in touch with some people. I got a very nice letter from him saying, "Thanks a lot, and if I have more questions, I'll call you back, and I've already gotten in touch with some of the people"—one of whom, by the way, is Dake Gull.

WILLIAMS: I've talked with him.

HENDERSON: I was going to say, do you include him? Because he's a pioneer.

WILLIAMS: Yes. We've talked on the phone a couple of times.

HENDERSON: A very nice person.

WILLIAMS: I would really like to be able to interview him, but I'm afraid we're running out of time and money. But he's done a number of history-oriented things also.

HENDERSON: Yes. He and I reviewed Colin Burke's book on the Vannevar Bush cryptology (20), and it was a good exercise. I hadn't worked with him for a long time, and I found him still very pleasant.

WILLIAMS: You seem to have been busy editing. This is something you've done throughout your career.

HENDERSON: Yes, whipping materials into shape. For example, I did a report for the National Bureau of Standards called *Evaluation of Information Systems* (21). I wrote all those informative abstracts and sent them back to the authors saying, "Is this an accurate reflection of your work?" Which means, of course, that I read everything and tried to understand it. One man wrote back and said, "You did a better job than I did on the original article!"

WILLIAMS: Looking at your bibliography, there seems to be hundreds of them that you've done the editorial work on.

HENDERSON: Yes, and that was my first job for Perry: "Read this thing through." If I'm doing that kind of work, I have to understand what I'm reading, and if it doesn't come through easily to me, then I question, "What is it you're trying to say?" So I read it as somebody knowledgeable but not necessarily into the very thick of something. Yes, and I've done book reviews. I have had many more functions as editor than I have of author.

WILLIAMS: Back to this "woman in a man's world." Have there been really obvious signs of discrimination?

HENDERSON: I didn't experience them except maybe in the chemistry lab, in bench work. I was the supporting player in the analytical lab at DuPont and the support of graduate students at

MIT. But I never felt put down by men and, as a matter of fact, I have often said that women did better in the computer area and the information processing area than in a lot of other more traditional areas like bench chemistry, because it was so new that women got in on the ground floor and grew with the field.

WILLIAMS: What about in terms of pay and promotion? Particularly NBS when you came back and worked there.

HENDERSON: I got to be a GS-15 at NBS and I think I've read somewhere that about 1 percent of the women in the government workforce ever get to be a GS-15. I got more discrimination there because I was seen as a threat or a rival. I got to be a Section Chief and the Division Chief was going to be leaving, and all of a sudden I would be on a par with some of these bright young men who'd come up, born with computers, and I was this older woman that was going to be suddenly on the same level with them. Now Ruth Davis was one of my last bosses at the Bureau of Standards, and when she left to go to AEC and her deputy stayed as the acting director of the Institute, he was much more comfortable with the young men. They were, you know, thirties maybe, where I was fifty. One time I asked for support to go to an American Chemical Society meeting in Hawaii because I was a chairman of the American Chemical Society Committee on Copyrights, which is of importance to everybody including the information area, and I had to fight to be sent on official time. Finally the Bureau agreed that I could go on official travel and they paid per diem. I came back and I found that a young man who had just joined the Institute from the Operations Research group at the Bureau had requested to go to Hawaii for a meeting of the Operations Research Society. They sent him lock, stock and barrel, and while he was over there he sprained his ankle and came back and claimed Worker's Compensation! The place was in an uproar, you know, and I thought, "What goes around comes around!" But that was as close as I came. I have said that toward the end of my career there, especially after Ruth Davis left—she was something of my mentor—there were times that I felt that I was being discriminated against because I was a woman and probably an older woman.

WILLIAMS: In terms of promotion?

HENDERSON: Yes. For example, I requested of my immediate supervisor, the Division Chief, who left to join Ruth Davis, that if he thought my work was that good, to put me in for an in-grade pay raise. You know, you can get an in-grade increase on the basis of merit, not just time in-grade. He submitted it and the acting director said, "Well, we'll wait until next year," or something like that. But I knew that a young man who wanted a certain job got an in-grade to compensate. So, there were funny things going on.

I was a Section Chief and I asked particularly that nothing be done to destroy the section until we could work together, the other divisions and the section, to make most efficient and

effective use of the people in the section. Then I went to a staff meeting and they said, "The section's abolished as of today, and people are going to go here, here, and there." That was not a nice way to behave. But I had the feeling that even if I had been a man, having gotten up that high in the hierarchy, I was a threat, a rival, and the going gets pretty tough, and if I didn't have the stomach for that sort of in-fighting, then I was the one who would feel the effects. It's not so much male-female discrimination or age-youth discrimination as it is power plays, I thought.

WILLIAMS: Could some of that have been because you weren't really a computer nerd, so to speak?

HENDERSON: I'm sure that they figured that I wasn't a computer nerd, yes. I'm not. I took some courses at [University of] Maryland and decided, "I don't really want to know how to build a computer." I want to use the computers but I don't want to either build them or repair them.

WILLIAMS: Talk a little bit why you went to Maryland. I notice you took some courses there in computer science.

HENDERSON: Yes.

WILLIAMS: You also did your MPA.

HENDERSON: That was at American University, yes. I was pretty sure that I didn't want to take the conventional courses in library science, and so I thought computer science, but a couple of courses there were so much directed at the mechanics of the computer rather than the utility of the computer that I thought, "This is not for me." The American University initiated a program called the "Key Executive Program," in their School of Public Administration, aimed at senior level government workers. What we did was work all day Friday and all day Saturday every other weekend, and in two years time we got a Master's in Public Administration. Our agencies had to do without us only two days a month. We would work day times when we'd be more alert, none of this five or six years of evening courses. I went in to Ruth Davis and I showed her the announcement and said, "I'd like to get into this." She said, "Okay. You want the time?" I said, "I want the tuition, too." She said, "Well, let me think about it." She did. She had already nominated me, and I had completed a year, as a ComSci Fellow—the Commerce Science and Technology Fellowship—was an effort to get people out of the laboratory and into the realm of the real world. I had been at the Bureau of Standards eight years, I think, then. This was 1971-1972, and I thought the Bureau of Standards was the big player in the Department of Commerce, and I got down to an assignment in the Department of Commerce and discovered the Bureau was this little appendage out there in Gaithersburg, so it

was an eye-opener. I worked for the National Business Council for Consumer Affairs, which was an effort to get businessmen together without fear of anti-trust, so they could talk about things like guarantees and warranties and different programs that they could undertake under the aegis of this Council. We met people from Sears and from Mattel Toys. It was very interesting. We went on field trips, went up onto Capitol Hill and I can remember we met Gerald Ford before he got to be a Vice President and then President. We went to the Library of Congress and all of the different departments had briefings for us. We went out to the West Coast, went to Napa Valley and said, "We're here to see about the chemistry of wine-making."

WILLIAMS: You were really into the Department of Commerce thing there?

HENDERSON: Yes. We went down to New Orleans and went out on a sulfur-drilling rig—Freeport Sulpher in the Gulf of Mexico—and they gave us a souvenir: a paperweight molded from elemental sulpher. We went down into a salt mine near the Tabasco plant and we toured Tabasco while we were there. It was half fun and half very, very educational.

WILLIAMS: Let's back up a little bit. Okinawa. How did this happen? Your husband was stationed in Okinawa?

HENDERSON: He was stationed in Okinawa.

[END OF TAPE, SIDE 7]

HENDERSON: I went over with two-and-five-ninths children and had a little girl in July of 1961 and another one in August of 1963, and then we came back in September of 1963. Drove across country.

WILLIAMS: Mrs. Schultz said that one of your goals was to have as many children as she had and keep working full time or two or three jobs, as she had. [laughter]

HENDERSON: [laughter] Yes. She's a dear person, a very nice person.

WILLIAMS: All right. So now we've been in and out of the National Bureau of Standards, but we'll get you there officially. This looked like to me a big switch from what you had been doing, but as you explain it, it sounds like it's not really a switch out of documentation and notation.

HENDERSON: No. I started out working with Mary Elizabeth Stevens on that cooperation study—the three "Cs" (19)—and then I did some more reports that involved reviewing the literature.

WILLIAMS: Still all in the documentation area?

HENDERSON: Yes. Mary Elizabeth wanted me to come on board to help with that one report.

WILLIAMS: Mary Elizabeth Stevens was your boss at NBS?

HENDERSON: Yes, at the beginning.

WILLIAMS: Who is she?

HENDERSON: She was a computer specialist. Her strong point was critical review writing and editing, reviewing the literature. If you look up M. E. Stevens or Mary Elizabeth Stevens in any bibliography, you'll find things like the report she did on automatic indexing (22). She was very good at collecting information in published literature and reducing it to a state-of-the-art summary. She was very good at that, and that's what the "Cooperation, Convertibility" report was. She said to the Bureau of Standards, "I might want her to do something else, so I want her to be an employee with an appointment that's called 'WAE'"—When Actually Employed, you get paid. Sure enough, I can't remember exactly what she switched me to soon after I started working with her, but it was a very useful interaction. I worked with her on that WAE basis, I think for three years. I was living in Aberdeen and I came down to Washington, DC and got work and went back home and did the work, and came down and brought that, and went back home and did more, and so forth. In 1967 Dick retired and we moved to Bethesda, and at that time, the people at NBS asked me to consider coming on full time. Dick was in graduate school at Catholic University doing part-time studies and part-time thesis work, so he stayed home with the children and I went to work full time at the Bureau of Standards.

WILLIAMS: In 1967.

HENDERSON: 1967, yes. He was a house-husband before the phrase was invented. I'm sure that's true of Claire Schultz's husband.

WILLIAMS: Yes, I think so. Someplace along the way you were doing some work with the Federal Library Committee also.

HENDERSON: Yes.

WILLIAMS: This was part of the NBS work.

HENDERSON: Yes. When I first started to work with Mary Elizabeth at the Bureau of Standards, Sam Alexander was the head of what was then the Information Technology Division. He asked me to work with him on a review or a state-of-the-art report of interest to and aimed at the Federal Library Committee. As a result of that, the Federal Library Committee asked me to join their Task Force on Automation. Now that was strictly extra-curricular. I had approval from Sam and then it seems to me that Herb Grosch came in there at some point. When we moved out to Gaithersburg, the Information Technology Division became the Center for Computer Sciences and Technology, and Herb came on board as Director. I'd known Herb since the days when he was at GE pushing the machine that was going to take Perry's Searching Selector into the new world. Then he was replaced after a couple of years, I guess, by Ruth Davis. Both them approved of my doing this Task Force on Automation work, going to Federal Library Committee meetings. You'll notice that in my bibliography, several presentations were about the programs of the Federal Libraries (23).

WILLIAMS: It looks like to me that you sort of became <u>the</u> guru on Federal Library automation.

HENDERSON: Yes, and I was the point person in the Center for Computer Sciences on library applications and documentation, as opposed to the information processing and data processing. The Center was working on things like Tom Bagg's optical character recognition standards and on Fortran standards and on Cobol standards and on magnetic tape standards: the Federal Information Processing Standards series—FIPS.

WILLIAMS: You knew Tom Bagg but didn't work with him?

HENDERSON: Only in that we were in the same organizational unit.

WILLIAMS: I assume you know he died a year or so ago.

HENDERSON: Yes. I went to his funeral and it was just beautiful. He was Scotch through and through and they had a bagpiper out there. It was beautiful.

WILLIAMS: He's on my list of pioneers.

HENDERSON: Yes, he certainly was.

WILLIAMS: I did not realize he had died and I e-mailed NBS folks to try and find him, and they said he had died, and I said, "Well, do you know what happened to his papers?" and it turned out they had done, apparently, a really nice thing. They had split them up between two or three places that were really interested in that kind of thing. I have not talked with his widow yet and I thought I would do that.

HENDERSON: Betty. Yes.

WILLIAMS: Just to see what's left.

HENDERSON: They had a house, a little old charming cottage in Potomac when Potomac was the outskirts [laughter], and now Potomac is just overrun with five hundred thousand-dollar-houses, the Congressional Country Club and stuff like that. Well, he had this little old house and we went up there one time visiting and I said something about the shed out in the field and he said, "That's where my *Journal of the Optical Society of America* is housed." We went out to look and it was just stuffed to the gills and it wasn't waterproof, it wasn't humidity-proof. It was just stuffed full of magazines and journals that were falling apart, and I said, "Tom, these are no good." He said, "I'm not going to throw them away!" And his office! He had an office bigger than this and it was just up to the ceiling, everywhere, and he knew where everything was, you know, but he just was a pack-rat.

WILLIAMS: Good. That means he should have a good collection of stuff to disperse then.

HENDERSON: Oh yes. He was in on microfilm and optical character recognition and early computers. If you can, find out who has anything.

WILLIAMS: They said some went to Michigan with the Power Collection, on the microfilm stuff, and I've forgotten—some had stayed at NBS, but it sounded like all the right places.

HENDERSON: All right. Good.

WILLIAMS: Let's go back. It sort of happened semi-accidentally that you became the federal guru for Federal Library automation?

HENDERSON: I had always had my foot in each camp. I was friendly with and got along well and worked on various projects with librarians in the federal library community. I also was a sci-tech information type. That's why I could speak up to Henriette Avram, who wouldn't dismiss me as not worth her concern, but would tell me what her concern was and ask me to pull the other community in "where they belonged." That kind of thing. I couldn't become a member of the Federal Library Committee because I didn't run a federal library, but I could become a member of the Task Force on Automation because I knew library automation and I could talk to both camps, if you will.

WILLIAMS: The librarians didn't mind? Here comes Madeline Henderson without her MLS?

HENDERSON: No, because I never tried to run their business. I just talked to them about the things that I could talk about that I wanted them to be interested in.

WILLIAMS: On standardization?

HENDERSON: Yes. Standardization and automation and cooperative processing and that sort of thing.

WILLIAMS: You mentioned ANSI, the Z-39 standard. What was your initial role with this?

HENDERSON: COSATI Standard for Technical Reports was taken up by ANSI and I was a member of that committee. I think I might have chaired it the first time around. We tried to develop a standard technical report format that would please both private sector organizations that were generating reports and the federal sector that had a pretty well established and mandated format. We've already mentioned the ANSI Z-39 format for information interchange, which I used but didn't have a role in developing.

WILLIAMS: Was the Federal Library Committee a well-functioning organization when you first became involved?

HENDERSON: Yes. The librarians had common problems, and they had a home in the Library of Congress. They had the support of the librarian, L. Quincy Mumford. Kurt Cylke, who was the Executive Secretary then, was a real go-getter. When he decided to take the job as head of the Library for the Blind and Physically Handicapped, I applied for his job. I think I could have done the job and I would have gotten along all right with all the librarians, but I didn't have the credentials. The search committee didn't accept the idea of a non-librarian as head, so they brought in Jim Riley, who was very good. Then it got to be almost entirely the function of the Federal Library Committee to act as the node for OCLC; it kind of became a case of the tail wagging the dog.

WILLIAMS: Yes, that's what I've heard, too.

HENDERSON: The National Bureau of Standards had a job advertised as Director of Technical Information and it would include the Publications division and the Library division. I applied for that. Made up my CV and so forth, and I got a letter back saying, "I had no idea that you did all this, but..." [laughter] They gave the job to an administrative type from the Office of Administration, and I don't think he lasted very long. But anyway, I had to just smile to myself: "I had no idea you had all these qualifications and background."

WILLIAMS: What about office management? How large was your staff when you were the Section Chief?

HENDERSON: It was a small section: four or five professionals and two or three clerical help.

WILLIAMS: Mostly keeping up with all these various issues?

HENDERSON: This is why the master's program was so useful. What had been happening before I became Section Chief is that the section collected information and shelved it—reports from NTIS and books and subscriptions to journals and so forth. That library was something of a reading room for some people who'd come by and look at the latest issues of some of the journals. But in the meantime, other sections and divisions were collecting their own stuff and our Section was getting progressively less meaningful to the Institute. (The Center for Computer Sciences became an Institute for Computer Sciences—one of those modifications that again is a power struggle: Ruth Davis wanted to be on the same level as the Director of the Institute of Basic Standards and the Director of the Institute of Measurement Services, the core

science that the National Bureau of Standards stood for.) So when I took this course, my research practicum was how to modify and bring the Section into the mainstream of the Institute. At this point, everything that came in was being processed in the sense that it was being recorded and indexed, but nobody ever consulted the indexes and it was a complete duplication of what was done for government reports and NTIS. I think we were on the standard distribution list for computer reports. So I stopped the processing and I recommended that we shelve things by date of acquisition and use the existing services to index. We turned our attention to us using the literature to prepare reports, a little bit like Mary Elizabeth's state-of-the-art reports. When the decision was, I thought, being considered—what to do with the Division of Information Technology and our Computer Information Section—my thought was that our people would work with the specialists, the hardware specialists and the software specialists, to do this review and collection of literature on a given topic, and we'd work together to produce reports. But that didn't work out.

WILLIAMS: Any idea why?

HENDERSON: Well, as I say, it was a power struggle, and the guys who were hardware specialists figured only they knew the hardware, so why would they want anybody else to interfere? What they did was, for the people that actually would work in the Computer Information Section, physically place them in the hardware section or the software section. What they ever got to do, I don't know. I had a chance to get out, early retirement, and so I took it, and that's when I started consulting. I consulted for ten years, and I think in my CV I spoke of some of the agencies that I worked with. The thread running through most of that is standardization.

WILLIAMS: As it had been during your years at NBS.

HENDERSON: Yes.

WILLIAMS: So you saw your consulting as a follow-on?

HENDERSON: Yes.

WILLIAMS: Was this mostly pretty well funded consulting, something you could do a couple of days a week at home?

HENDERSON: Yes, and go into offices and do things like that.

WILLIAMS: How did you get this work?

HENDERSON: People called me. Word of mouth. People would call up and say, "Will you come and talk to us?" and I'd talk to them about what they wanted done, and then I'd submit a proposal: so many hours of work, over such-and-such a period. Two days a week over the next three months, or something like that. I found it very interesting and as far as I know, people were satisfied, although the CENDI agencies I don't think ever did anything with all the good advice I gave them.

WILLIAMS: Is that still sitting in some drawer?

HENDERSON: I suppose. It's just like people asking what happened to the Weinberg report and the Crawford report and the SATCOM report: big fanfare when they're introduced, and never heard of again. Not quite true, but all these things sink into the subconscious and affect the way you do business down the road. I was trying to get the four reports processing agencies and the GPO together on the processing of technical reports.

WILLIAMS: This is while still at NBS, right?

HENDERSON: No. When I was consulting.

WILLIAMS: Oh, I thought you did some work with them while you were at NBS. That's one of my questions. I may have gotten that wrong.

HENDERSON: No. That was when I was consulting.

WILLIAMS: Let's talk about that. I thought it was when you were with NBS. Because this is one of the great curiosities. I teach a course in government information so I've been following this over the years. I want to ask Melvin [S.] Day when I talk with him tomorrow, why couldn't GPO and NTIS ever get together? But let's go back specifically to what you were doing.

HENDERSON: Why don't NTIS and GPO get together? Did you read my *Government Publications Review* article in which I championed that idea?

WILLIAMS: No, I didn't. I saw that on your citation and I kept intending to get a copy of that. This is in *Government Publications Review* (24)?

HENDERSON: Yes. Would you like a copy?

WILLIAMS: Sure. I'd love that. That will save me another trip to the library. Now, you did this work as a freelance consultant.

HENDERSON: Yes.

WILLIAMS: But you also did the Compliance of Federal Agencies with ADP Standards. That was while still with NBS?

HENDERSON: Yes.

WILLIAMS: Then your copyright issue. That's a really big thing that you did a lot of work on.

HENDERSON: Yes, and now I'm still active in this respect. I attend a group that meets for lunch once a month, other than in the dead of summer, in Washington. It's called the Copyright Roundtable. It's composed of copyright lawyers for such organizations as the Motion Picture Association of America, the Recording Industry of America, the Association of American Publishers, different law firms that have copyright sections, the administrator of copyright for the American Chemical Society, the copyright liaison for the Patent Office. We used to have the Washington representative of the American Library Association but she hasn't been there lately. I keep telling them I'm not active enough to be part of this group, but I learn a lot. I don't contribute a lot anymore, but I learn a lot. The current concern is copyright in electronic publishing. I don't know how you solve that because in this course that I took, the Internet course, the instructor said several times, "Everything on the Internet is free. If you put it on the Internet, it's there, and you don't have any more right, any more protection for it. It's gone. Anybody can do anything." This is very true. People now violate copyright, but it's a drop in the bucket compared to what—

WILLIAMS: My assumption is that if it's copyrighted by someone, let's say it's a page of some type, or a design, that you just do like you always did. You had to sue if you saw someone copying it. But yes, the distribution is a lot faster and easier and quicker now if you want to steal something.

HENDERSON: The stealing is a lot easier because who knows, if you downloaded it, that you're going to be doing something with it? For years, I served on the Register's Committee to examine fair use, Section 108. The Register was supposed to review Section 108 every five years and that's how I got into this Copyright Roundtable because I was the information science community's representative on that committee. The library community was so adamant about fair use. "We can make this stuff available." It wasn't until a couple of people sued the Kinko kind of operation and the Texaco suit, that I think there's a very fine line. I also served on a committee of the American Chemical Society to review the *Chemical Abstracts'* proposal to make available copies of articles that they abstracted.

[END OF TAPE, SIDE 8]

WILLIAMS: While you were at NBS, you were doing work on the Federal Information Locator System, the FILS, which led to GILS?

HENDERSON: Yes. That was a contract when I was a consultant. I was asked to come back to the Bureau as a consultant. I contributed to the discussion of the need for standardized vocabulary in the FILS and brought to their attention a number of thesauri that were already in use in government agencies, and recommended the adoption of one of those as a way to control the vocabulary of the people who were filling out the FILS.

WILLIAMS: Was the FILS thing already ongoing by the time you became involved?

HENDERSON: It was, I think, fairly well developed but not an improvement of the Federal Locator System. It wasn't being used as it should be and one reason was that people didn't think they could find things, or hated to be bothered with it. The Bureau of Standards was reviewing the system, the hardware and software system, and I was reviewing the content of the system.

I'll tell you another story. Years ago, when I was first at the Bureau of Standards, a friend who was hardware-oriented, a computer-type, and I went to the visit the ERIC system with Ted Brandhorst. I think he asked for some advice. We went down and talked to him and she talked about the tape format for the system, and I talked about the data elements. When we got out, she said, "What were you talking about? That had nothing to do with it." I said, "I thought we were perfect complements, because you were telling him how to input and I was telling him what to input." [laughter] But there was a problem early on with computer-types not really understanding what it was, and I think that's part of the difference that I had with Henriette Avram. We agreed on how to input, but we didn't agree on what to input. My

contention was that it didn't have to be only one way. If we knew how to input, then we could talk to each other.

WILLIAMS: Probably this kind of miscommunication and our concentration on different areas has caused a lot of troubles in terms of the computer folks and the information folks talking.

HENDERSON: I think that when the library community tried to get into the use of computers and had to go to the computer people, like in an agency or in a company, and say, "I want some time on the computer, and this is what I want," it was very hard to talk the same language, especially if the library types didn't really have any idea how to do it. They just knew what they wanted to do, and the computer types wanted to translate that into how to do it. It was fairly difficult. It's not so bad now when, on a LAN [Local Area Network] or through a modem, you can communicate directly with the machine, if you know that it's got the program to work with, or if you can get time to input your own program, or you've got a workstation. I can remember when we first got consoles, the CRTs [Cathode Ray Tube], in the offices at the Bureau of Standards. We were hardwired to the mainframe in the basement of the administration building. We thought, "Isn't this great? Instead of carrying over a tray of cards or a little package of cards with the instructions or request or whatever you had to fill out, we can access the computer directly." Every office in the Institute for Computer Sciences had a CRT.

WILLIAMS: What year was this, do you remember? You started there in 1964.

HENDERSON: Yes. The 1970s. We had access to the computer. These were just CRTs, hardwired.

WILLIAMS: Dumb terminals.

HENDERSON: Dumb terminals. I can remember walking down the hall and looking in the offices and there were the engineers sitting there banging away on their keyboard, just having a grand time, and I thought, if we told them they had to type that document, they'd be horrified. "That's not my work!" [laughter]

WILLIAMS: You said something a while ago that piqued my interest. You said when trying to decide what kind of additional education to get, that you were pretty sure you didn't want to go the library science route. Was this something you looked into? Did you go talk to people at Catholic? Because you were taking courses at Maryland?

HENDERSON: Yes, but this was before there were schools of library and information science. I don't know whether I talked to somebody or got the idea, and it could have been a completely erroneous idea, but I didn't think that I needed to learn how to lay out catalog cards—not what to put on the cards, but how to put it on the cards—and technical processing to some extent. But a lot of the library, the older based library studies, I didn't think I wanted. No. I didn't go and talk to somebody at a school.

WILLIAMS: Did you have something of a similar reaction when you started taking the computer sciences courses? Because you said that you didn't want to know the inner workings of the machine.

HENDERSON: Yes. I found that they were too technical about the inner workings and the mechanics of the computer than I felt I needed to know. Again, I kind of straddled two fields, and at that point, there weren't schools that straddled the two fields.

WILLIAMS: Let's talk a little bit more about ADI, ACS, and SLA [Special Libraries Association]. You joined ACS really early because I saw that you were a fifty-year member.

HENDERSON: Yes. [laughter]

WILLIAMS: When did you join ADI? Do you remember?

HENDERSON: As soon as they made it open to individual members.

WILLIAMS: 1952-1953?

HENDERSON: Yes.

WILLIAMS: What about SLA? Did you join?

HENDERSON: I never joined SLA. You were talking earlier about special librarians in chemical industry, and in the early days special librarians were more nearly librarians. They might have had a degree in chemistry but they were primarily librarians running libraries.

WILLIAMS: When you say "early days," when do you mean?

HENDERSON: 1950s and 1960s, when I said that most of the activity was being done, most of the systems development work was being done by sci-tech types or by chemists who wanted to improve access to their own reports. But I think anymore, any librarian is more information scientist—unless it's perhaps a children's library librarian, and even they have to be, certainly, aware of the available resources, what they have available to them.

WILLIAMS: You'll still find very traditional programs and then ones that are very much what I would call information science oriented. For example, my school is pretty much a mixture of the two, but more toward the traditional side than it is toward the information science side. So there are all kinds of variations out there. Within ADI, ACS over the years, you've had lots of offices, but never one of the top elected positions. Why is this?

HENDERSON: I used to think that you waited for people to come to you and tell you that they wanted you to run for an office or they wanted to give you an award, and I have learned more recently that you have to do the pushing and the asking. I had a friend who was in the federal government who said, "I got an in-grade award every year because I did the paperwork and got my boss to sign it." I thought you were supposed to wait for your boss to say, "I think you deserve it." So I never had the street smarts that pointed to some of the recognition that I might have sought.

WILLIAMS: Or deserved!

HENDERSON: Thank you. [laughter] The Watson-Davis Award is an accurate reflection of my service to ASIS, but it's all behind the scenes. It's all things like writing columns in the *Bulletin* and helping to edit proceedings, and helping to organize sessions. Some of my efforts fell through. I chaired the luncheon for pioneers at the Boston meeting. Lea Bohnert and I had great ideas for publishing a report, a book, from that luncheon, but it fell through partly because this was after I had retired from consulting. In 1987 or some time like that.

WILLIAMS: This was for the 50th Anniversary in 1987.

HENDERSON: Yes. And partly because the people that we relied on for reports from the individual tables didn't come through, and partly because Lea was, I think, slipping at that time. She died in 1990, but she was not as active as she had been. Neither one of us had the resources in the form of staff and I think she had maybe left Rhode Island at that point. She was living in Rhode Island but had left the library school.

WILLIAMS: Should she be on my pioneers' list, in your view?

HENDERSON: She's dead now, but she should, yes.

WILLIAMS: She had a significant influence on the field?

HENDERSON: She was an educator. She was a teacher at library schools and made a significant contribution that way. She didn't do systems design but what we said of Lea when she died—Claire Schultz wrote her *In Memoriam* piece for *JASIS* (25), and they were very good friends; I wrote a half a column for the *Bulletin* of ASIS—was that she was always trying to keep us on the right path by telling us that evolution, not revolution, was going to serve us well. She was the one that said librarians and information specialists are trying to accomplish the same thing but using different language and therefore not accomplishing as much as they could have been accomplishing together.

WILLIAMS: Back to the elected positions.

HENDERSON: Yes. I didn't run.

WILLIAMS: Compare yourself with Mrs. Schultz, who seems to have been successful in the political end. Did you all have different approaches to this, even though you were good friends? Was she a more political person?

HENDERSON: I don't know. She was president of ADI or ASIS when? Do you remember?

WILLIAMS: 1961, 1962 or 1963, somewhere right in there. I think 1962.

HENDERSON: She won an Award of Merit, I think, didn't she?

WILLIAMS: I don't remember that for sure. I know she was the first woman president.

HENDERSON: She was the first woman president, and it was 1962. Lea Bohnert recommended her, nominated her, or pushed her presidency because she believed, like I do, that Claire is a very capable person and deserving of all the recognition she can get. If Lea had said anything to me at the time—I was in Okinawa, but you know, some time, even several years later, I might have agreed that I would like to be thought of in that way. But I never really pushed and I think that you have to have, in the first place, gone up a few steps. For example, I served on several committees but I was never on the Board of Directors. I was Chairman of the local chapter, but way-back-when—the Potomac Valley Chapter. I don't know why. I just never was asked to, and therefore I never pursued the idea.

WILLIAMS: It takes a different kind of personality to push themselves forward.

HENDERSON: It seems to me that I can remember Lea Bohnert saying, "We need a woman president. I'm going to try to get Claire Schultz to do it," or something like that.

WILLIAMS: When I talked to her about this, I believe she said that Heumann was the person who nominated her.

HENDERSON: Karl Heumann? All right. But Lea could have planted the idea.

WILLIAMS: Yes, I think she said that Lea Bohnert also pushed it in some way. I've forgotten exactly how that happened. It's always a matter of interest to me, and I think lots of folks, talking about the politics of organizations and those folks who get elected, and it's maybe akin to what we say—we never elect the best person to be President of the U.S. either.

HENDERSON: [laughter] Yes. I served as the secretary of the AAAS [American Association for the Advancement of Science] section on information and computing, and that was because I was asked to do it. Larry Heilprin was the chairman at that time, and Joe Becker was the secretary before me, and he was on the west coast and never got to meetings, and Larry said, "It's time to nominate a new secretary. Will you run?" I said, "Yes, I can do that." I worked hard for eight years, and got a lot done, I thought. But then I decided it was time. It's much harder to be in one of those positions without office support. I can take messages and get around to doing something about it, but with a secretary, for example, who will not only take the message but put the thing in the mail to somebody, it makes a big difference.

WILLIAMS: This is how you got on the AAAS, because this is a nominated position also, isn't it, to be a Fellow?

HENDERSON: The Fellow of the AAAS came about because in the mid-1950s, I would guess, some time in that period, Perry and I were both active in the American Institute of Chemists [AIC], in addition to the American Chemical Society, and Perry from his position, and because I was a part of his team—and I guess maybe Allen Kent, too, I'm not sure—were nominated as Fellows of the American Institute of Chemists. The AAAS then said, "Well, if you're a Fellow of an affiliated society, you're a Fellow of us." Dick used to say, "You're a FAAAS (farce) and a FAIC (fake)." I've been a Fellow since 1964, and I was the first woman chairman of a Gordon Research Conference, and I chaired an Engineering Foundation conference out at Asilomar in California and then participated in a couple, helped to run a couple up in New Hampshire, the Engineering Foundation. They never achieved the stature of the Gordon conferences—at least in our minds—because the Gordon conferences were chemical.

WILLIAMS: The Watson-Davis Award must have pleased you.

HENDERSON: Oh yes. I was very pleased and I was very pleased that Nancy Roderer presented me as the recipient because I consider her a good friend. Somebody reported to me later that Gene Garfield in the audience said, "It's about time!" [laughter] I remember I said in my acceptance speech that I hoped that I would be active in ASIS for a few more years, and somebody shouted, "Many years!" So I was pleased with the award and with the reception. But as I say, I think it's an honest appreciation of all I've done for the Society.

WILLIAMS: Lots of writing and editing over those years that represents hundreds of hours, nights and weekends.

HENDERSON: Yes. That anniversary issue of the *Bulletin* that we put together was a lot of work (26). A lot of work. I still hear from Linda Resnik every once in a while. She's someplace in Texas.

WILLIAMS: In terms of those who impressed you the most in early documentation work, whom do you recall most strongly or would you say had the greatest influence on the development of documentation and therefore information science?

HENDERSON: I think of the people who worked in Washington, for example, or were in and out of Washington frequently. I think of Mort Taube with the Uniterm system and Doc Inc. He made private enterprise possible, if you will, or believable because he made Doc Inc work.

WILLIAMS: Was he a likable person?

HENDERSON: He was very aggressive. He and Calvin Mooers and Jim Perry were kind of the trio of pioneers. Three different approaches to the same problem. Calvin tended to be kind of defensive. Nobody gave him enough appreciation for what he was doing, didn't really pay that much attention. Yet Calvin had some great ideas, and he was not able to present them as well and as forcefully as Mort, for example, who had a great idea of the Uniterm system of coordinate indexing that flew in the face of pre-coordinated subject headings. You coordinate them when you want them, if you want them. He certainly sold his ideas. I used to say, he'd get contracts with agencies to set up a Uniterm system for their collections, and then he'd hire the people from the agency to work for Doc Inc so that they could go back in and do the work. "No wonder he's successful." [laughter]

There are lots of people that I met. Saul Herner. I used to say that Saul Herner made a success of his business because he knew what he could do and he did it. He didn't try to be all things to all people. He was good at certain phases of information processing and book writing and report writing, and he used to stick to that. I think this was maybe in contrast to my feeling that Mort Taube was trying to be everything to everybody, and Saul was plugging along with his own little company and doing just fine.

Gene Garfield has been a sparkplug on our team, in our world, for a long time.

WILLIAMS: What do you mean by that?

HENDERSON: He had good ideas, great ideas. He was aggressive. He was sometimes abrasive, but he had good ideas. *Current Contents* was simplicity personified, but it works. If you can read these tables of contents, you can decide, "Boy, I should look at that one." I do that when I come home from Florida and we have four months worth of *Science* and *Chem Engineering News* piled up waiting for us. I go through the Tables of Contents, and I tear out an article if it looks interesting and throw the rest of the book away.

WILLIAMS: Did you have many dealings with him over the years?

HENDERSON: Yes. He and I have been very good friends. He took me to dinner at his house one time. I got the feeling that he thought, "This is a nice girl. My mother will like her!" [laughter] He's had a rough life, personally, but I think that he's certainly built quite an organization there in Philadelphia. He had good people. That's a sign of a good manager. He gets good people working for him.

WILLIAMS: It's a big company.

HENDERSON: Yes. It's quoted everywhere. ISI [Institute for Scientific Information] citation index results and studies of citation indexes. I never mentioned Father [Roberto] Busa in all this.

WILLIAMS: I don't know that name.

HENDERSON: All right. Father Busa is a Jesuit from Rome.

[END OF TAPE, SIDE 9]

WILLIAMS: Father Busa.

HENDERSON: Yes. He came over to talk to Perry in the early 1950s. He had a project. He wanted to study the writings of St. Thomas Aquinas and to do linguistic analysis. I don't know all of the fine points of linguistic analysis, but you look at not only the words that are used, but the endings of the words and what that means, what that connotes, and so forth. He needed help, so he came to IBM, and they turned him over to a man named Paul Tasman, and he was doing this linguistic analysis with IBM punched cards. Then he graduated to tape, and then microfilm, and then CD ROM. He has published the *Index Thomisticus* (27), which is thousands of pages of analysis of the writings of St. Thomas Aquinas. Thousands of pages.

WILLIAMS: I don't recognize the name because I've stuck strictly to Americans, but if we go international that's certainly someone to keep in mind.

HENDERSON: Oh yes. He's a delight. He and a young Episcopal priest, who was doing an analysis of the Revised Version of the Bible using Remington Rand cards when Father was using IBM cards, met at MIT one time and compared notes, if you will. Just were glad to meet each other. But that has been his life work. I guess we met in the early 1950s or mid-1950s, and he's been a very close friend of the Perry family and also of the Henderson family for all these years.

WILLIAMS: In terms of a researcher, who comes to mind from the early years?

HENDERSON: I think Gerry Salton. He was fairly early on with his research. He thought that semantic factoring wasn't the way to go.

WILLIAMS: Would you put Perry and your work into the research area, or into the development area?

HENDERSON: I would put Perry as a researcher. I think that when we were exploring the concepts of semantic factoring, we were doing some very interesting work and, I thought, important work. The problem that I think we faced is that we were trying to work in a time—I think, especially when Perry and Kent went to Western Reserve, that they veered off into a path of increasing complexity at a time when it was not easy to handle that much complexity because of the limitations of the equipment available. That, to me, sitting away from the work itself, was kind of a disappointment because I thought that the idea of semantic expression, semantic analysis, was getting bogged down in the sheer weight of all the things that had been tacked onto it.

WILLIAMS: What about the Western Reserve Selector Machine as an exemplification of that?

HENDERSON: One of the things that Perry taught me was how to wire a punched card machine to get the kind of sorts that I needed. That was interesting. The Searching Selector was a special purpose machine that came along too late to be of any real value because general purpose machines were being improved to such an extent and so rapidly. I think that might also have been true, and I don't know whether Claire said this, when she worked with the Univac. The early Univac was a room full of equipment.

WILLIAMS: We talked about it in terms of more the loss of Sperry to IBM's influence and not so much in terms of the Univac as a machine, as a general purpose computer that could process lots of information.

HENDERSON: I think Hans Peter Luhn made great strides, with his KWIC indexes.

WILLIAMS: With SDI [selective dissemination of information]?

HENDERSON: Yes, and SDI.

WILLIAMS: Was the Western Reserve Searching Selector an extension of the Luhn ideas?

HENDERSON: Well, what Luhn did and demonstrated any computer could do now, or could have done then if you were working in upper case letters or numbers, and the Searching Selector did. It made information freely available across a record. You didn't have to have fields like you did on punched cards. This field is the date, this field is the first name, this field is the last name, and so forth. So that if you wanted to find all the Hendersons, you had to look for them in a certain field. Whereas, the Luhn Scanner, you just said, "I want Henderson," and it looked across the whole strip of how ever many cards that it looked at, until it found what you asked for.

WILLIAMS: That's the unit record approach. Would you describe it as that?

HENDERSON: The tabulating machines were unit records, but they were fixed fields, because you couldn't sort unless you know what field you were sorting on. With the Luhn Scanner and the Searching Selector and computers now, you look for the information that you're looking for. No matter where it exists in the record, you can find it because the machine will scan the whole record. The unit could be a dozen cards, but it'll find what you're looking for because it's not restricted. Now, ASCII, requires that you put certain information in certain places because if you're going to interchange, the guy who receives your record has to know where certain information is. But then within the fields, you can be more open in your records, in your recording. Pete Luhn—I'm trying to think back to those days. There are so many people that marched in and out of our lives: the Patent Office crew, that did a lot of very good work but, again, they were before their time. They were trying to work with chemical patents on a 101 statistical machine, and if you had only the chemical patents class, you still had a lot of information, and it was very hard to try to emulate what the mind does. It looks at a chemical patent and says, "No, not that one. Oh, yes, that one looks good."

WILLIAMS: I've seen what you put on your resume in terms of your views of your major accomplishments, but I'd like to hear it in your own words.

HENDERSON: All right. I think that the first work that I did for Perry on the organization of the information about chemical structure searching was an important contribution. I think that thread running through my professional life of the value of standards and standardization, whether it's vocabulary control or OCR characters, or language standards, is important—the application of standards. I would have liked to have been able to say that I brought CENDI agencies into the real world with cooperative cataloguing. I will be interested in what you hear from Mel Day. Mel wore many other hats besides the Director of NASA and NTIS. Joe Caponio was the director of NTIS when I was doing most of my work.

WILLIAMS: He followed Mel Day, right?

HENDERSON: Yes, and I think he was probably more receptive to the idea, but he also recognized that he was one manager among a group of managers. He could not require all of them to do anything, and it was very difficult to get GPO to give up anything that they were doing. Whether today's budget cuts have moved any mountains, I don't know.

WILLIAMS: More likely, the Internet's moving mountains but it's yet unclear exactly what that will do—access to the Internet. Let's go back to your work with the chemical notation. Can you be a little more specific there in terms of what you consider your central contribution, and particularly to distinguish it from Perry's? Is it possible to separate the two in any way?

HENDERSON: It was certainly an entirely different project from the semantic factoring and the system design work, the efforts to establish a way to handle the literature as opposed to the chemical structures that may be in the literature. Even the people like the group at DuPont that did the Uniterm system found that they needed links and roles because they needed to link two units of a chemical structure together when they belong together. My contribution was to collect and organize and make available to the committee, of which Perry was a part, the work of a dozen people and organizations around the world who were concerned with this molecular structural searching. I think that the contribution that that made was to make people, chemists and chemical information specialists, aware of a problem, aware of a general approach to the problem. It just was something that interested me and intrigued me and I felt that I was part of it, even though, like you say, it was early on evident that Dyson was going to be proclaimed the international standard, even though it never got used, as far as I know. But it was a step in the direction of helping chemists to see the scope of the problem and ways to approach solving that problem other than nomenclature, because that's all we had used up to that point—nomenclature. I did not invent a system. I did not invent a notation system, and I did not have a hand in the decision about the utility of notation systems.

WILLIAMS: When *Chem Abstracts* finally got their system working, both for the Chemical Registry, but as well as for the machine handling of all of the notations so that that worked through that connection table system that they developed, they gave some credit to the folks at DuPont. The name I can't remember. Is that possible that it's Gluck?

HENDERSON: Yes, I think that that name rings more of a bell because I think it's a name in the Division of Chemical Information.

WILLIAMS: Yes. I have here, "Morgan of CAS develops an algorithm to translate two dimensional structural diagrams into a tabular form that can be manipulated and searched via

computer, based on work done by Gluck at DuPont." Is there any connection between what you were doing and that, as far as you know?

HENDERSON: No. The next development was the connection table, and we had left behind our work by then.

WILLIAMS: You had gone on to more general kinds of things.

HENDERSON: Yes.

WILLIAMS: I think there probably is some connection, but I don't know enough chemistry to sort it out.

HENDERSON: Well, there's a connection in the sense that he started with structural units, which is what the notation systems started with, and instead of trying to depict those structural units in a linear fashion, he wrote the program that connected them almost in three dimensional—in a connection table that was not available to the people who were doing the linear notations because they were at that point still working with punched cards.

WILLIAMS: Yes, with punched cards, much fewer features to sort on. What have we not covered that you'd like to cover in terms of final things to say? I just wonder if there are some issues that we've missed.

HENDERSON: No. I probably will think of something tomorrow. It's been an interesting life. It's been an interesting career. I've worked hard at everything I've been involved with, and find great satisfaction in what I have done, even the things that never quite came to fruition, like the semantic factoring as a going operation.

WILLIAMS: Your standards work seems to me to have really taken hold pretty firmly.

HENDERSON: I hope so, although some of the standards work, like for the CENDI agencies, I wish they could have moved on. I was very pleased with the results of the Federal Library Committee's members embracing cooperative cataloguing, especially in view of the fact that they were so sure that it wouldn't work. Yet it works very well. My only regret is that the other side of the federal community, the technical reports processing agencies, as far as I know, continue to process reports, don't they? NTIS is still in business.

WILLIAMS: I've never looked into the detail as to who submits the cataloguing copy for the stuff you get in GRAI. I guess I had always assumed that the submitting agencies did it, but that if there was a record already in the database, they would check and see.

HENDERSON: I think that they do that, but I think they also convert to a format maybe that's their own.

WILLIAMS: No, I think it's all in COSATI.

HENDERSON: They all use COSATI form?

WILLIAMS: I assume so.

HENDERSON: Well, certainly NTIS was doing some, at least standardization. They maybe checked for things like the standard format for the corporate source or something like that.

WILLIAMS: Yes. It may not be as far along in terms of total coordination.

HENDERSON: Total acceptance of the standard. Because I told you about this discussion we had about whether you needed anything more than initials. The Library of Congress insists on finding out what the real full name is, and what the standard format is, so that no matter what's on the book or the report, they want to be sure that they've got the standard name. I'm sure that NTIS checks for standard expression—since they've got this corporate authority list—of the corporate author, but whether they try to look at the report and say, "We're going to spell out the name." I think the DOE does not. I think that DOE even shortens the name to initials. But NTIS might spell it out again. Whether they do any of that or not, I don't know. But they have cataloguers. They have a cataloguing staff, so the cataloguers did something. There is a tendency, again, job protection and turf protection and so forth, and a tendency to forget that you're cataloguing for the user, not for yourself.

WILLIAMS: Definitely. When I teach my government information class, and come to the section on technical reports, I go through all of those individual indexes, and I have a sample page out of each one to give the folks in my class, so I'm trying to match up in my head what all I remember about the differences. There are some differences, but I have put them all under the COSATI label that they were all following that.

HENDERSON: Yes. I had a tape version, or a disk version, instead of a printed version of the CENDI Cataloguing Guidelines. Do you have them?

WILLIAMS: I've seen them.

HENDERSON: Okay. But I think that they put them together after our sessions, when I was guiding them through this—"Let's describe the data elements that you have, and which ones do you have in common, and how do you define them and come up with a list of common data elements with standardized definition so that you can run." After I left they took over, which they should do. They should then, based on these recommendations that I made, do their own thing, and they came up with some CENDI Cataloguing Guidelines which should cut across the four agencies. If you have a copy of that, it might be interesting.

WILLIAMS: I'll go back and look at that. I'm going to ask Mel Day about it.

HENDERSON: Yes.

WILLIAMS: Anything else we haven't covered about your life? One thing I want to cover. You've done some work in the history of information science. What should we do about it to make this work better? What kind of work do you think needs to be done?

HENDERSON: See now, that's been so long ago that the pioneer luncheon, which we hoped to publish, and at the time I said to Dick Hill, "If you could devote some staff time to putting this thing together," but now it's so late that maybe I should go through that packet and see what, if anything, can be salvaged, or what, if anything, would lead to another person.

[END OF TAPE, SIDE 10]

[END OF INTERVIEW]

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